THE METAL INDUSTRY
WITH WHICH ARE INCORPORATED
THE ALUMINUM WORLD, THE BRASS FOUNDER AND FINISHER, THE ELECTRO-PLATERS REVIEW, COPPER AND BRASS
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NOTES ON COPPER

By Wirt Tassin.*

IMPORTANT PROPERTIES OF COPPER.

Copper, either alone or as a constituent of alloys, is, next to iron, the most useful of metals. Its high degree of malleability, ductility, toughness, electrical and thermal conductivity, resistance to oxidation combined with its color, luster, high melting point and its capability of being forged, rolled, spun, cast and tool-worked give it a place that can be filled by no other single metal. Its degree of malleability is exceeded only by that of gold and silver. Its degree of ductility, though exceeded by that of gold, silver, platinum, iron and nickel, is such as to enable it to be drawn into the finest of wires. Its toughness is such that it resists fracture by bending, torsion, etc., long after its limit of elasticity has been reached. Its conductivity for electricity and heat is exceeded only by silver. Hence its fitness for use in electrical construction and in engineering work where evaporative power combined with durability is required. Unlike iron it is not liable to a progressive oxidation nor does its decomposition products exercise a destructive effect upon the materials with which it is in contact. It can be cast, rolled, forged or otherwise worked into a variety of shapes, and this, together with its color, luster, ease of polishing and susceptibility of being variously colored give it a widespread use both as a material of engineering and as an art metal. The winning of copper from its ores presents more of an appearance of complexity than probably any other metallurgic operation, and yet no other metal excels it today in commercial purity.

In the United States copper for use in the trade is listed under but three heads—electrolytic, Lake and casting. The standard of the metal and the simplicity of the trade requirements have operated against the introduction of the many varieties of copper as "best selected," "tough cake," etc., which characterize the English trade. This simplicity of classification and high standard of the metal has perhaps led American manufacturers to use in many cases an unnecessarily pure metal for many purposes where a less pure and cheaper metal would do as well and in some instances even better. Comparatively few consumers exercise any exact control over the character of the metal as purchased nor is there any set of standard methods for the determination of the amount and kind of impurity such as exists in the steel industry. Hence, there is a wide divergence of opinion as to the relations existing between chemical composition and physical properties and many consumers buy largely on brand and appearance. Brand is of value in that there is usually a reputation back of it.

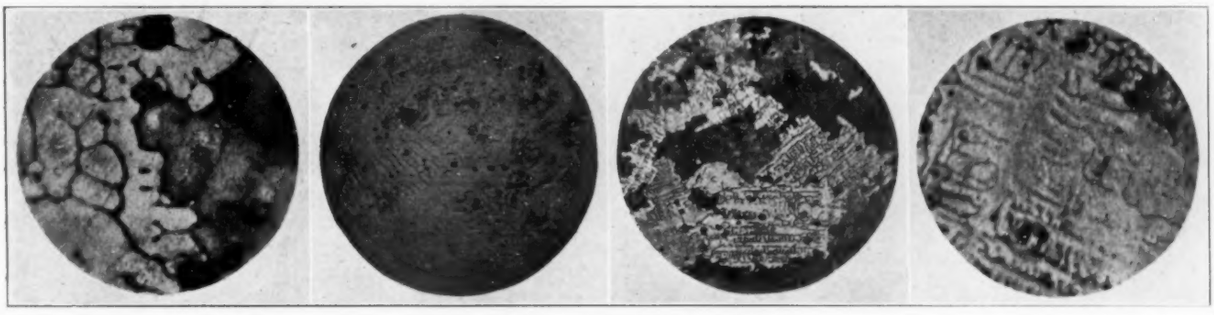

Fig. 1. Copper showing lines of segregated oxide. x 150 dia.

Fig. 2. Copper in relief showing lines of segregated oxide. x 90 dia.

Fig. 3. Copper etched with ammonium persulphate showing oxide. x 90 dia.

Fig. 4. Copper etched with ammonium persulphate showing oxide. x 150 dia.

The appearance of the shrink and pitch, or top surface and fracture of the ingot, is to the trained eye quite a reliable guide to the character of the metal. Thus copper which has been "overpoled" will usually have a longitudinal ridge with occasional "worms" or "spews" along the surface of the ingot. Hammering such copper will develop a loss of ductility and malleability. The fracture is only a little silky at the best, the grains are unequal in size and there are a number of differently sized and irregularly distributed cavities, the larger of which are near the top of the ingot. "Underpoled" copper will have a longitudinal furrow or depression along the surface of the cast ingot, hammering develops cracks along the edges of the metal, the fracture is dry with no silky luster. "Toughpole" copper will have an even and uniform shrink and wave and the surface free from pits, shrink holes, swells, worms, spews and similar defects. Hammering shows a high degree of malleability and ductility. The fracture has a silky luster and the grain is fine and uniform in size.

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It is interesting to note the influence that color has upon many buyers under the idea that it is an indication of purity. This trade prizes most highly the deep rose red color, and is suspicious of and will reject any metal having a brassy appearance. As a matter of fact, the character of the color depends almost entirely upon the length of time that the metal is held in the molds and the manner in which it is cooled, the poorest of coppers may be colored a fine deep red and the purest a brass yellow almost at will.

The many varied uses to which copper is put should and does give rise to specifications looking towards the best metal for a particular use, yet many manufacturers pay no attention to the fact that a cheaper grade of copper may be used to advantage for one kind of work where its use would be ruinous for another; for instance, a little iron is rather an advantage in copper used for some rolling mill work, while its presence in an electrical conductor would be a decided detriment; again, in the manufacture of certain rods, tubes, etc. English practice in general desires the presence of a little arsenic, while American practice will use a very pure copper. Again, most manufacturers remelt their copper, yet only a few of them appreciate the fact that a saving equal to the refiner's melting charge can be effected by using electrolytic cathode copper in place of ingot metal. The kind and quality of the copper purchased should be governed by the use to which it is to be put, and some specifications covering some of the several kinds are here given.

Fig. 5. Copper etched with ammonium persulphate showing oxide.

Fig. 6. Copper etched with ammonium persulphate showing oxide. x 960 dia.

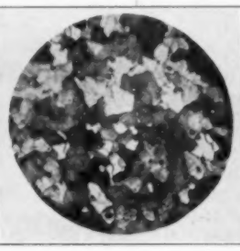

Fig. 7. Structure of nearly pure copper.

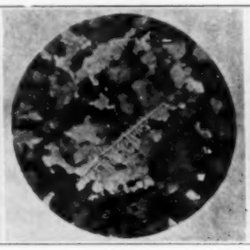

Fig. 8. Structure of copper containing oxide.

Fig. 9. Copper practically free from oxide. x 150 dia.

SPECIFICATION FOR COPPER FOR ELECTRICAL USES.

The material desired under these specifications is ingot copper, wire bars, or billets. The ingots, wire bars or billets shall have a brand stamped or cast upon them. The metal content shall consist of not less than 99.85 per cent. of pure copper, as determined by the electrolytic assay, silver being counted as copper. The chemical analysis shall be made on ten ingots, wire bars or billets taken at random from each lot of 25,000 pounds. The ingots shall have two holes, approximately ½ in. in diameter, drilled slowly and with a dry bit, not less than half way through each piece on the diagonally opposite sides. The scale, if any, shall be rejected. The drillings freed from any mechanically admixed iron with a magnet, then thoroughly mixed and the chemical analysis made on a suitable sample taken from them. The wire bars or billets are to be similarly sampled except that the drillings are to be taken from the extreme ends of the wire bars or billets.

The electrical conductivity shall not be less than 98.25 per cent. on annealed samples. The electrical conductivity is to be determined on one piece taken at random from the selections made for the chemical analysis. This shall be hot rolled to a ⅜-in. round and then drawn cold to a wire 0.0808 in. (No. 12B and S gauge) in diameter. A sample shall be cut from each end of the coil so drawn and tested for conductivity. The ingots, wire bars and billets shall be so well and carefully made that the shrinkage during cooling does not cause cracks, shrinkholes, or a concavity along the top. They shall be free from cold sets, pits, swells, feather edges and similar defects.

SPECIFICATION FOR ELECTROLYTIC CATHODE COPPER.

The material desired under this specification is electrolytic cathode copper as free as possible from other substances. The metallic content must assay over 99.85 per cent. of pure copper by the electrolytic assay, and must contain less than 0.005 per cent. of bismuth. The chemical analysis shall be made on samples taken at random out of each lot of 25,000 pounds. The samples so taken should represent at least 5 per cent. of the lot. These samples shall have at least one hole approximately ½ in. in diameter, drilled with a dry drill not less than half of their thickness. The drillings so obtained shall be freed from any mechanically admixed iron with a magnet, then thoroughly mixed and the chemical analysis made on a suitable sample taken from them.

SPECIFICATION FOR COPPER FOR MAKING INTO TUBES, RODS, PLATES, ETC.

The material desired under this specification is copper billets, cakes or slabs. The copper content shall not be less than 99.40 per cent. of pure copper, as determined by the electrolytic assay. The material may contain in addition to the copper not more than 0.40 per cent. of arsenic. It must be free from bismuth and antimony, and must not contain more than 0.10 per cent. of lead. The chemical analysis shall be made on samples taken at random out of each lot of 25,000 pounds. The samples so taken shall represent at least 5 per cent. of the lot. These samples shall have at least one hole approximately ½ in. in diameter drilled with a dry drill about 2 ins. deep near the center of each end. The drillings so obtained shall be freed from iron with a magnet, thoroughly mixed and the chemical analysis made on a suitable sample taken from them.

The billets, cakes, or slabs shall be so well and carefully made that they shall be free from physical defects, such as shrinkage cracks, shrink holes, swells, pits, cold sets, feathers and similar imperfections.

SPECIFICATION FOR INGOT COPPER.

The material desired under this specification is ingot copper as free as possible from oxides and from any other substance. The ingots shall have a brand stamped or cast in. The metallic content shall not be less than 99.50 per cent. pure copper as determined by the electrolytic assay, and must be free from bismuth

and antimony. The chemical analysis shall be made on not less than 5 ingots, taken at random out of each lot of 25,000 lbs. These ingots shall have 2 holes, one on each diagonally opposite side and approximately ½ in. in diameter, drilled slowly and with a dry bit not less than one-quarter the way through each piece. The scale, if any, should be rejected, the resultant drilling freed from any mechanically admixed iron with a magnet, mixed and the chemical analysis made on a suitable sample taken from them. The ingots shall be so well and carefully made that the shrinkage during cooling does not cause cracks or concavities upon the tops of the ingots; nor shall there be pits or swells.

CHEMICAL PROPERTIES OF COPPER.

Copper, like other metals, is liable to contain a certain amount of impurities, whose general effect is to alter to a greater or less extent the physical properties of the metal. The impurities commonly present are oxygen, arsenic, antimony, bismuth, etc. Certain of these impurities when present in small amounts may under some conditions be beneficial or at least not harmful; others, even in the most minute amounts, may be decidedly injurious. Thus a bar having only 0.005 per cent. of bismuth may be of such a poor quality that it cannot be rolled, and is both hot and cold short. Copper unites with oxygen to form two oxides, cupric or black oxide, CuO, and cuprous or suboxide or red oxide, Cu_2O. The cupric oxide is formed with the aid of heat at temperatures below the melting point of copper. It has no effect on the physical properties of the metal, and little attention is paid to it except that its presence may cause surface defects in rolling and also in that it contains nearly 80 per cent. of copper, care should be taken to prevent excessive oxidation and all the oxide formed should be saved and its copper content recovered.

The cuprous oxide is formed only when the metal is in the molten condition. It is soluble in the molten copper in all proportions up to the saturation point, or until there is no longer any copper in excess, and separates out when the metal freezes. The influence of this oxide on the metallurgy and the physical properties of copper is far reaching. Too little oxide increases the solvent power of the molten metal for certain gases, which causes it to "spew" at the moment of solidification. Too much oxide makes the metal hot and cold short. A certain amount of oxide in the presence of certain metallic impurities tends to neutralize the injurious effects of these impurities. The best of commercial coppers contains a certain amount of cuprous oxide, and the amount present has a limiting effect on the conductivity, the higher the oxide content the lower the conductivity. So far as the other physical properties are concerned, less than 0.40 per cent. of oxide has no effect; with about 0.45 per cent. there begins to be a loss in toughness, and at 0.90 there is a loss of ductility in the cold; with 2.25 per cent. there is a marked loss in ductility, even when hot, and at 7 per cent. there is a complete hot shortness.

CONTROL OF CUPROUS OXIDE.

The control of the cuprous oxide content is of vital importance in the casting of copper. Depending upon the oxide content, the metal may be hot or cold short, or brittle, weak and wanting in tenacity, or it may possess the maximum ductility, tenacity, conductivity, etc. In making castings of high electrical conductivity and using the same grade of copper in the melts, one melt may give low conductivity castings, the other high, depending almost entirely on the oxide content. Too much oxide breaks the continuity of the grain (Fig. 1), and the segregated oxide increases the resistance in proportion to the amount present. Too little oxide permits of the absorption of gas, thus causing holes and cavities and producing an unsound casting with a low conductivity.

Cuprous oxide is soluble in the molten metal, but separates on cooling, as a definite constituent, which may be easily recognized under the microscope. The oxide as etched with a cold 15 per cent. solution of ammonium persulphate is light blue in color, and may be distinguished from sulphides, antimonides and similar compounds in that it is colored a deep black with hydrofluoric acid. The appearance of cuprous oxide in the same field but under progressively increasing powers is seen in micrographs 2 to 6. Micrograph 2 is a section of copper polished in relief, and at 90 diameters the lines of segregated oxide may be plainly seen. Etching with a cold 15 per cent. solution of ammonium persulphate in water develops a structure which appears as in Fig. 3, and at a magnification of 150 diameters appears as in Fig. 4. With a higher power the structure of the oxide segregation begins to develop (Fig. 5) and at 960 diameters the arborescent groups of acicular crystals of the oxide may be distinguished (Fig. 6).

Fig. 10. Fig. 11. Fig. 12. Fig. 13. Fig. 14.

PHOTOMICROGRAPHS OF COPPER SHOWING INFLUENCE OF OXIDE MAGNIFIED 150 DIAMETERS.

It has been stated that the control of the oxygen is the crux of copper refining. The part played by oxygen in copper may be likened to that played by carbon in steel. Unfortunately the methods for the determination of oxide in copper are long and tedious, and the copper melter has no quick and reliable method for the determination of oxygen, such as the steel melter has for carbon. He is compelled to determine the condition of the metal solely by its appearance and behavior, and his experience is the only guide as to the amount of correction necessary to produce good metal. The amount of cuprous oxide present in copper has a direct influence on its structure. In micrograph 7 is seen the structure of practically pure copper. This

metal had a composition of 99.99 copper and a conductivity of 104, Matthiessen standard. It will be noted that the grains approximate the same general size and shape, none are elongated, and their boundary lines are regular, and the edges of the grains are not serrated.

If, now, a small amount of cuprous oxide be added to such copper, the effect on the structure is at once apparent (Fig. 8). Certain of the grains show a decided elongation and have numerous serrated markings along their boundaries, and frequently there are similar markings within the grain.

The effect of the oxide on structure led to the preparation of a series of small ingots of practically pure copper, to which progressively increasing amounts of cuprous oxide were added. Micrographs of this series are shown in Figs. 10 to 14. They are all at a magnification of 150, and were etched for the same period of time in a cold 15 per cent. solution of ammonium persulphate in water. Fig. 10 shows the structure of the practically pure copper, and each succeeding figure shows an increasing amount of oxide till with Fig. 14 the mass consists entirely of a eutectic of cuprous oxide and copper. These results are so characteristic that they appear to offer a ready method for the quick approximation of the oxide content in copper that is sufficiently rapid and accurate to act as a foundry control. As the personal equation is somewhat of a factor in metallographic examinations, it is first necessary to prepare a set of standards for reference, just as carbon standards are used in the determination of carbon by color in steel. This may be done by mixing progressive amounts of cuprous oxide with finely divided copper prepared from copper sulphate and then melting under a heavy flux of sodium silicate.

(To be continued.)

THE MODERN BRASS FOUNDRY CORE ROOM AND THE OLD

By P. W. Blair.*

In these days of the molding machines which are in use in all up-to-date brass manufacturing plants, manufacturing plumbers, steam, gas and waterworks brass goods, owing to their increased production over hand labor of the same style of patterns, one of the most important items is to have the cores ready when the operators of the molding machines are ready for them. The molder molding by hand may be able to arrange his work so it may mean a temporary disadvantage. It is seldom the case where cores are used for machine molding. There are so many cores used of irregular shapes and delicate construction in manufacturing the above line of goods that the core boxes should be made from good, solid material, cast iron or cast steel, as it is more economical in the end if they are made out of these materials. The writer has seen core boxes used every day in the year that were made from machine steel, case hardened, and while it costs more to make boxes out of this material, it is more economical in the long run, as a box will be obtained that will wear for years and give good results.

By keeping the core boxes in first-class condition and watching the wear on them, enables the core maker to increase his output. Sometimes plain cores require time and care in making, although they may be small, in which case do not try to make too many in a gang box at a time as they may cause trouble when turning out on a plate by sticking and breaking. The majority of brass manufacturing plants are now employing girls as core makers on small cores and those with irregular shapes, and if one watches them at work they are apt to note the few false moves a girl makes. Every movement is a part of what is wanted to produce a core. The question has been put to me quite often if girls are a success as core makers, and I can answer from personal observation that they are good producers, and that is one of the main points in manufacture. They are easily managed when treated with consideration and given good surroundings and conditions, and when asked to hurry work along, do so and they take pride in their production. The best of them earn from ten to sixteen dollars per week, working nine hours per day.

In a core room where a number of men, boys and girls were employed, and rivalry ran high, it was suggested that a certain man who claimed he could beat the best of girls at making cores, use a certain box and make as many cores as he could in a certain length of time, and then the girl use the same box for the same length of time. It was done, and the man made 1,500 and the girl 2,000. It comes natural to many girls to cook and it is very natural for some to make cores and bake them. While I have given credit to the girls, I do not wish to be understood as endeavoring to underrate the trials of the coremaker or his ingenuity in surmounting obstacles, as all the heavy work in connection with the making of cores or where ingenuity has to be brought into use develops from the man coremaker.

One of the main points in an up-to-date core room is the baking and handling of cores, as any one that has been around a core room soon finds out that the large per cent. of his losses in cores are in the baking and handling. Good solid trays and shelves for storing the cores before they are ready to use should be provided for and a record of them kept, so when ready to use one can know where to locate the different cores. Reports should be delivered to the foundry foreman, of cores on hand at 4 p. m. on the preceding evening to allow him to plan out his work for the different machines next morning and with foundry and core departments working in harmony good results will be obtained.

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LEAD COATING PROCESS.

The Sherard Cowper-Coles process for lead coating steel, etc., is an electrolytic one and has the advantage that it is very rapid, and therefore the plant required for a given output is comparatively small. Also the electrical energy required to deposit a ton of lead is low compared to other metals such as copper and zinc. The process is being applied to a variety of purposes, such as the coating of steel plates which can be utilized for the same purposes as terne plates (plates dipped into a molten bath of lead to which a small percentage of tin is added). Plates coated by the electrolytic process have a smoother surface, which is very advantageous for certain classes of work. The process is also applicable to the lining of pipes for the conveyance of corrosive liquors, the lining of pumps, chemical vessels, etc. It can also be applied to the coating of earthenware and wood.

NEED OF SPECIAL ALLOYS FOR SPECIAL PURPOSES*

By W. H. Bassett.†

The development in engineering construction has arrived at a point where the use of special alloys for specific requirements needs attention. These requirements may be considered under two heads: first, the physical requirements; second, resistance to corrosion.

The physical properties are easily studied in the laboratory. Machines have been devised for obtaining not only the tensile strength and elongation, but for studying hardness and resistance to abrasion and the behavior of the material under repeated stress and shock.

The matter of corrosion has been one of a more or less mysterious nature; partly, perhaps, because of a want of knowledge on the part of engineers as to the composition of the various alloys with which they deal.

Confusion has arisen on account of the names of alloys.

A NEW MILL FOR ROLLING LEAD.

The United States Light & Heating Company of New York have recently installed the lead mill shown above at their Niagara Falls plant, of modern design for rolling sheets used in connection with their storage battery work. The mill consists of one stand of two-high reversing rolls with bodies 16 inches diameter, 42 inches long. The bottom roll only is driven and the screw down, operated by hand, is provided with a micrometer drum for accurate rolling. On each side of this mill and geared to it, are two 18-foot tables with rolls closely spaced to permit rolling thin sheets. The mill and tables are driven by a reversing motor, and, as they are geared together, the reversal of the mills effects the reversal of the tables. At the finishing end of the mill, another table section 18 feet in length is provided. This table is independently driven by a separate motor and acts as a feed table for a 42-inch Guillotine Shear which is located at the further end and is also driven by a separate motor. The mill is designed to roll down slabs from a maximum thickness of 3 inches to a sheet of a minimum thickness of 1/64 inch or one pound lead. The whole installation was designed, built, installed and started by the A. Garrison Foundry Company of Pittsburgh, Pa.

The nomenclature used in the non-ferrous metals trade is confusing to those who are not familiar with the business. This nomenclature has, through usage, become so firmly rooted that it is practically impossible to change it. The trade names have an actual value to the producers of various material and they would naturally resist changes which would destroy such values. Years ago, Thurston undertook to introduce the name "Kalchoid" for the stronger brasses which contain a considerable percentage of zinc together with tin or iron or a combination of these elements; but as "Bronze" was a more euphonious name and represented a metal of higher cost, the trade simply paid no attention to Thurston's suggestion, and today we have several classes of "Bronzes," *i. e.*, copper-tin alloys which are properly "Bronzes"; the copper-zinc alloys of a red color which are properly red "Brasses"; and the classes of alloys (which Thurston called "Kalchoids") which are properly Brasses containing some element or elements to give them strength and protect them from corrosion.

It would be quite evident to any chemist that accelerated corrosion at the expense of the metal containing the larger proportion of zinc will take place if two "Bronzes," one of an alloy of copper and tin and the other of the "Kalchoid" type, are placed together in an electrolyte such, for instance, as sea water. We often are asked to explain why a gun metal propeller is lost from the end of a manganese bronze shaft. It not infrequently occurs that brass strainers are held in position with copper or gun metal bolts, or a brass screen is put into position with copper rivets and burrs. Of course, galvanic action is set up in all of these cases to the destruction of the alloy containing the greater percentage of zinc. This destruction is usually brought about by the dezincification of the alloy containing the larger proportion of zinc. When this action has taken place, the material left behind is a mass of spongy copper having very little tenacity but still retaining the shape of the original material. The brass manufacturer has many times, on account of this action

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been accused of sending out his material without proper mixing. There is certainly need of more education along the line of prevention of corrosion by not putting together alloys which will naturally set up galvanic action under the conditions of exposure to which they are subjected. With iron and steel there is hardly a parallel case, but such a variety of non-ferrous alloys is possible, and the composition of alloys produced by various makers for the same work so different that material of different compositions not infrequently finds it way into the same structure.

One of the best examples of the need of alloys for special purposes is that of the condenser tube problem. Condenser tubes have been made of Muntz metal having the composition of approximately 60 parts copper to 40 parts zinc and of brass having a composition of approximately two (2) parts copper to one (1) part zinc. Muntz metal is one of the alloys which may be worked hot, and is composed of mixed crystals of the α- and β-alloys. In the presence of sea water, galvanic action is started between these alloys with the result that the β-alloy becomes dezincified, leaving α-crystals in a mass of spongy copper. The action then reverses and the α-crystals are dezincified, finally leaving a tube made up of spongy and brittle copper which may be snapped off as easily as a rotten stick.

Brass tubes have proved but little better, since any substance like carbon or oxide of iron which goes into the condenser starts galvanic action with a result similar to that just described.

In order to overcome these troubles the Admiralty alloy was devised. This consists of 70 copper, 29 zinc, and 1 tin. It is much more resistant to corrosion than the alloys first mentioned as it is richer in copper and the tin exerts a protective influence. Under the conditions of exposure in polluted harbors, even this alloy will be destroyed through dezincification within a few years.

Attempts made to secure condenser tubes which would be still further resistant to corrosion, and tubes were made from alloys of copper and nickel, but these were not enough better than those from the Admiralty alloy to warrant the extra expense of production.

Attempts made to secure condensed tubes which would last by lining copper tubes with aluminum failed. Various alloys of copper, zinc and tin were tried, but none of these appeared to outlast Admiralty tubes in similar service. Finally a trial has been made with a special grade of aluminum bronze, known to the trade as "Benedict Bronze," with results which indicate that this bronze is very much superior to any other alloy which has been used in condenser tubes in the presence of sea water, and especially in the presence of water in polluted harbors. Such bronzes have generally been known to be particularly resistant to corrosion, but, on account of the difficulties which were encountered in working the metals, it has not been possible to handle them with success until recently.

Another illustration of the choosing of a proper alloy for a specific purpose is shown in the failures of screens made from brass wire. A number of years ago considerable quantities of wire screens were required for houses in a tropical seaport. Brass wire screen was asked for, and furnished in 2 and 1 brass. The wire used was of fine size, and when exposed to atmospheric influences would easily give way. The result of the exposure of these screens was that within a few weeks they had simply rotted and fallen to pieces. It was claimed that inferior brass had been furnished, but this was not the case. Fine wire or thin sheets of alloys containing considerable zinc, when exposed to sea air or to atmospheres laden with sulphur or to ammonia fumes which arise from decomposing nitrogenous matter in the presence of dampness, are more or less rapidly disintegrated. Experienced manufacturers of fine wire cloth are aware of this difficulty, and choose only alloys which carry small amounts of zinc, *i. e.*, less than 20 per cent., these alloys not being subject to the disintegrating action of such atmospheres as we have described.

Owing to the fact that alloys have been looked upon as somewhat mysterious, there is a feeling that it is simply necessary to put together some unusual combinations to make so-called new metals which will resist corrosion or have other valuable properties. This idea, even among intelligent people, is carried to the extent that statements are accepted to the effect that fluxes can be added to molten metal which will greatly modify the properties of the castings in their resistance to corrosion or their tensile strength or other physical properties. It is safe to assert that one skilled in the art of making alloys can duplicate in every particular any alloy of which he can obtain an adequate sample, provided, of course, that he has at hand the facilities for its production.

There is beginning to be a well-defined literature on the subject of alloys, and from what has already been published one can very closely predict the properties of various combinations of the more commonly known metals. For instance, Roberts-Austen, followed a number of years later by E. S. Shepherd and still later by Carpenter and Edwards, has very thoroughly covered the field of alloys of copper and zinc. The copper-tin alloys were similarly investigated by Heycock and Neville, by Shepherd and Upton, and by others. The ternary alloys of copper, tin and zinc were pretty thoroughly investigated by Thurston. An attempt to give an account of the work which has been done on the alloys of copper with aluminum, nickel, manganese and other metals would be entirely out of place at this time. There are, of course, certain particular fields which have not been very thoroughly studied, but the general properties of the alloys in these fields may be known by consulting a good metallurgical library. I simply desire to indicate that the microscope and the pyrometer have awakened new interest in the study of alloys and that this study has now progressed to the point where one can find, by consulting a reliable authority upon the subject, data which will enable him to predict the nature of almost any alloy of which he can conceive.

DISCUSSION.

MR. PARR:

Mr. Chairman, I think it is always dangerous to talk about anything that has not yet reached the point where you are satisfied with it. However, I do not know that we are ever quite satisfied with anything we are doing, so I will venture a word as to my work on alloys.

It may not interest any one with a laboratory fund so liberal as to make it an easy matter to keep up their platinum supply to the full extent of their requirements, but the case is different with me where I have been obliged to keep actively on the job after sixteen years of almost daily service a piece of apparatus which has in its make-up some three hundred dollars' worth of platinum. I refer to a Mahler bomb of the Atwater type. But more than that, instead of a single bomb to serve the needs of two or three men in investigations, and twenty-five to thirty students in class work, I want at least a half dozen. I have therefore been attempting to develop an alloy with properties as resistant to nitric and sulphuric acids as platinum.

We have reached a very satisfactory degree of success with an alloy of the nickel-chrome type having an amount of the latter constituent approximating 20 per cent. We have been able to produce quite a number of such pieces showing in $4N.HNO_3$ or $4N.H_2SO_4$, or a mixture of the above acids when preferred, a unit of 100 sq. cm. of surface and one hour of time, a solubility factor of 0.0 milligram. Other tests have shown dissolved metal

to the extent of 0.09 mg., still others 0.17 mg., etc. Our greatest difficulties, however, have been met with in attempting to cast this material, the shrinkage upon solidifying being very great. With an alloy of high melting point, above 1,200 degs. C., this feature has made the case at times almost hopeless. However, we have so far succeeded that a solid cap has been cast of this material and the same has been in use for over six months on our Atwater oxygen bomb with exceedingly gratifying results.

MR. BUELL:

I should like to ask Mr. Bassett with regard to the amount of ammonia produced from the decomposition of organic material in the various localities and if it is sufficient to materially affect brass. We occasionally have cartridges returned from some of the damp warm climates such as occur around Calcutta and in the vicinity of Memphis in this country, which crack in storage from no apparent reason. These cracks are not such as would come from heat cracking or from imperfect annealing or wrong composition. I would like to know if anyone has had any such experience with brass.

MR. BASSETT:

With regard to the question that Mr. Buell asked, I do not believe I know entirely as to all of the causes for this disintegration of brass. Those mentioned are some that I had had experience with. The exposure of brass articles to ammonia fumes from a dirty stable, particularly if the brass is in a hard condition, might cause it to break. An experience which I had at one time illustrates how rapidly and seriously ammonia will attack brass. A solution of copper sulphate and ammonia was mixed in a brass pail on Saturday afternoon. When the work with this solution was finished an assistant was directed to clean out the pail. He failed to do this, and on Monday morning it was noticed that the solution had begun to leak out, and the pail dropped apart between wind and water, although it was made from heavy metal. The brass in the lower section was a most perfect example of the so-called "disintegration of brass." The ammonia solution had simply rotted the alloy.

The difficulty in melting aluminum by itself, or in alloys, is its affinity for oxygen, and the failure of the oxide of aluminum to separate itself from the metal. The aluminum oxide stays in the metal, making a mess and causing all sorts of trouble. It leaves the alloy rotten and full of dirt.

MR. PRICE:

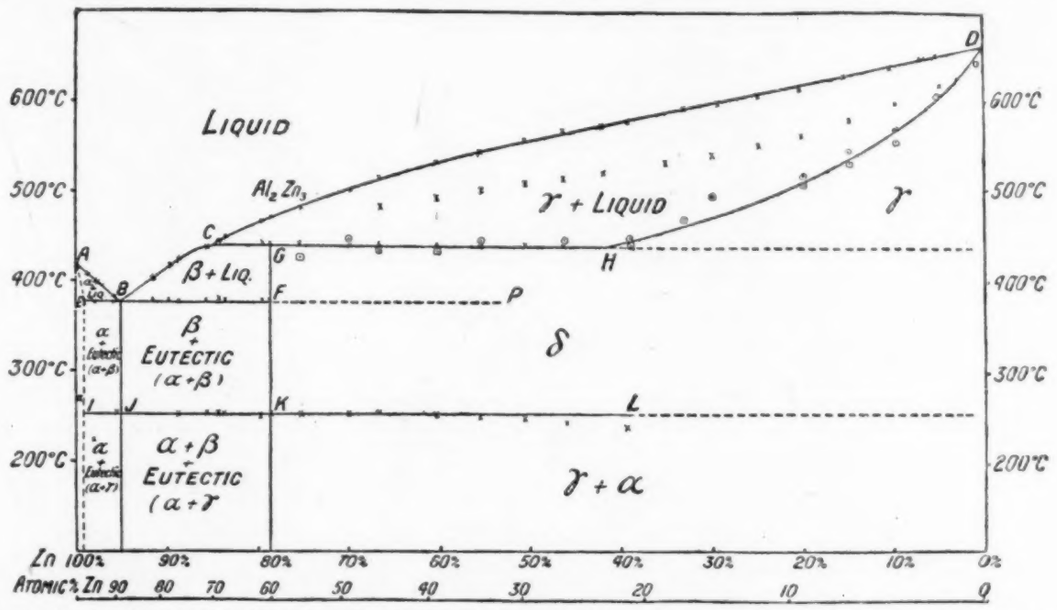
I think I can supplement these remarks of Mr. Bassett by stating a specific instance which came to my notice. We make brass acetylene generators for automobiles. We had one of these returned to us that was disintegrated. Upon investigation it was found that the disintegration was due to ammonia salts formed with the acetylene gas when the calcium carbide was acted upon by water.

ALUMINUM AND ZINC ALLOYS

The tenth report to the Alloys Research Committee was presented at the April meeting of the Institution of Mechanical Engineers, London, by Dr. Walter Rosenhain and S. L. Archbutt of the National Physical Laboratory, Teddington. The report consists of a tabulation by means of tables and curves of the results of a series of mechanical tests on alloys of aluminum and zinc, and also an appendix of ternary alloys of aluminum with zinc and copper. The authors report that they found in the course of their experiments that it is possible to cast sound and solid castings of these alloys without shrinkage, even though of complicated design. This is contrary to the usual belief that these alloys invariably crack in cooling, due to excessive shrinkage. These remarkable results are obtained, according to the report, by using sufficient lead and by employing other measures to neutralize the shrinkage.

If the results of the present investigation are viewed in the light of current practice in the application of aluminum-zinc alloys, the most important point is that the alloys richer in zinc, namely, those containing from 15 to 25 per cent. of zinc (with or without the addition of copper), are deserving of much closer attention and of more widespread use as compared with the lower alloys, containing less than 15 per cent. of zinc, which are much more widely used in present practice. If dynamic as well as tensile tests are taken into consideration, the outcome of the present report is to show that the alloy containing 20 per cent. of zinc is the most generally useful of the simple binary alloys.

In this brief notice of the outstanding results of the investigation mention must now be made of what is probably the most serious defect of this group of alloys, namely, their great sensitiveness to rise of temperature



NEW EQUILIBRIUM DIAGRAM OF THE ALUMINUM-ZINC ALLOYS ARRIVED AT BY MESSRS. ROSENHAIN AND ARCHBUTT.

in relation to their tensile strength. Thus the alloy containing 25 per cent. of zinc, whose tensile strength at the ordinary temperature is 27.5 tons per square inch, at a temperature of 100 degs. C. has a tensile strength of only 18.5 tons per square inch, and the rapidity of this drop in strength with rising temperature increases as the temperature is further raised. When very hot the alloys are accordingly very weak, but while they are brittle to shock and cannot therefore be forged at temperatures much above 400 degs. C. (752 degs. F.), in the testing machine, they still exhibit an exceptional amount of ductility. It is this somewhat abnormal behavior which makes it possible to roll into bars alloys which are brittle in the cast state, but at the same time it renders an accurate control of the rolling temperature an essential condition of success.

SUMMARY OF THE PRINCIPAL RESULTS.

The principal results obtained in the investigations described in the present (tenth) report to the Alloys Research Committee are briefly summarized as follows: (1) The Constitution of the Alloys.—This is only briefly dealt with in the report, since a full account of the metallographic study of the aluminum-zinc system has already been published elsewhere. The new equilibrium diagram arrived at by the authors is reproduced, showing the occurrence of reactions and the formation of a definite compound (Al_2Zn_3) whose existence had not previously been established. From the equilibrium diagram it appears that all the alloys containing more than 40 per cent. of zinc undergo transformation at a temperature of 256 degs. C. (493 degs. F.). As regards the alloys at and near the aluminum end of the series, the new equilibrium

A REMARKABLE ALUMINUM CASTING.

The above picture shows an unusually large aluminum casting which was recently poured at the Fairfield, Conn., plant of the Aluminum Castings Company, of Cleveland, Ohio, under the direction of their superintendent, W. R. Mample. This casting is for part of the base of a high power, six cylinder marine engine which is being set up by a well-known motor boat builder near New York City. As is customary in this case, it was poured from the standard No. 12 Alloy. Test bars from the same metal at the same time showed a tensile strength of 21,380 pounds per square inch. The casting, itself, weighs three hundred and seventy (370) pounds, which makes an unusually large one. This foundry has made a specialty of large castings of this kind, and is very well known throughout the trade for its excellent work.

diagram establishes their "solidus curve" or temperature of complete solidification, and also exhibits certain minor transformations which, although shown not to be due to a change in the pure aluminum-zinc system, always occur in commercial alloys at temperatures near their melting point. The alloys containing less than 40 per cent. of zinc are shown to be simple homogeneous solid solutions, although it is possible that the inversion at 256 degs. C. also occurs at this end of the series. When cast in chill molds, the microstructure of these alloys exhibits the sharply "cored" structure usually found in rapidly cooled solid solutions having a long range of solidification. In sand-castings this coring is less sharply defined and the whole microstructure is on a larger scale. The "cores" are entirely removed by prolonged annealing at such a temperature as 400 degs. C. (752 degs. F.), but they are removed rapidly and completely by the rolling process. Photomicrographs of the hot-rolled alloys, especially after annealing, containing up to 25 per cent. of zinc, exhibit the typical polyhedral structure of a perfectly homogeneous solid solution, although the scale of the crystals varies considerably according to the exact mode of treatment which the material has undergone. Photomicrographs of sand and chill-castings of the whole range of binary alloys are given in the report, together with some additional photographs of specially annealed and quenched specimens illustrating the typical features of the constitution of the system. Photomicrographs of typical examples of the structures of the rolled and drawn alloys are also given.

The Study of the Cast Alloys.—Tensile tests on sand and chill-castings of a series of alloys covering the entire range of the binary system are given, both in tabular and graphic form. The tensile strength of sand-castings shows a steady increase up to a concentration of 50 per cent. of zinc, when an ultimate stress of 18.7 tons per square inch is reached; there is then a slight fall of strength with further increase of zinc-content, followed by a rise to a second maximum near 75 per cent. of zinc, a concentration which corresponds approximately to the composition of the compound Al_2Zn_3. The highest ultimate stress reached is 18.9 tons per square inch. The table and curve representing the results of tests on chill-castings is somewhat different in type, three maxima being observed, namely, the first at 30 per cent. of zinc with an ultimate stress of 17.9 tons per square inch, the second at 50 per cent. with 21.6 tons per square inch, and the third at 75 per cent., with 20.1 tons per square inch. The yield-points for both sand and chill-castings are recorded as observed, but the observations were found to be somewhat uncertain in the case of the cast alloys.

In discussing the results of tensile tests on the present series of alloys the authors have used the term "Specific Tenacity" to denote a quantity which is proportional to the tensile strength and inversely to the specific gravity; this has been calculated by dividing the ultimate stress of a given alloy in tons per square inch by the weight of a cubic inch in pounds. The quotient is the breaking load in tons of a bar of the material whose cross-section is such as to make the weight of the bar one pound per inch length. From the point of view of tensile strength alone, this figure may be regarded as representing the value of any structural material, and allows of comparisons on a correct basis between materials of widely different specific gravity, such as these light alloys and steel. In the cast alloys the specific tenacity is found to reach its maximum for both sand and chill-castings in an alloy containing approximately 26 per cent. of zinc. The value attained is just over 150, as compared with a maximum value of 126 reached by the light alloys described in the ninth report. In the light alloys of aluminum with copper alone the specific tenacity of castings does not exceed a value of 99.

Compression tests on a number of chill and sand-castings of the alloys, including some of higher zinc-content, have been made. These tests show that in general terms the behavior of the castings under compression is approximately proportional to their behavior under tension. The highest yield-stress under compression was obtained with alloy No. 55 in the chill-cast condition, giving a stress of 22.96 tons per square inch. It is curious to find, however, that the chill-castings are decidedly inferior to the sand-castings until a zinc-content of about 50 per cent. is passed.

The question of the possible "ageing" or even gradual spontaneous disintegration of the aluminum-zinc alloys has also been studied in connection with the sand-cast material, tensile tests on some of the alloys being repeated on specimens which had been kept for over fifteen months, but no signs of any change were observed.

(To be continued.)

PROCESS FOR SOLDERING ALUMINUM.

A patent, No. 1,029,522, was granted June 11, 1912, to B. D. Avis, Jr., of Clarksburg, Va., for a Process of and Composition for Coating Aluminum or Its Alloys for Soldering. This is a very important invention, and is claimed to solve the difficult problem of soldering aluminum. The inventor has found that a mixture of chlorid of tin and zinc are suitable elements to make a satisfactory flux for this purpose. He says:

"To make this paste or compound, I proceed as follows: To from two to three parts of stannous chlorid by weight, I add one part of chlorid of zinc (I do not limit myself to these exact proportions as they may be varied without affecting the general result), the chlorid of zinc being added for the purpose of rendering the mass pasty, as a diluent, and also as tending to prevent the oxidization of the tin after it is deposited on the aluminum surface. This mixture is next heated until the mass becomes liquefied and excess of hydrochloric acid is expelled. On cooling this assumes a pasty form, and I now add a small quantity of powdered metallic tin. This is for the purpose of neutralizing any acid present, and to prevent the stannous chlorid changing into stannic chlorid ($SnCl_4$) through action of moisture and atmospheric oxidation, also this small addition of powdered tin seems to facilitate the deposition of tin on the aluminum surface.

"When using stannous chlorid alone or mixed with comminuted tin, it is desirable to heat it until the moisture and excess of hydrochloric acid is expelled; on cooling it becomes solidified and may then be powdered for use alone, or mixed with comminuted tin.

"To tin the surface of the aluminum I now apply this paste or compound to the parts I desire to solder and subject it to a heat somewhat below redness. This can be accomplished by merely holding the parts in the flame of a Bunsen lamp or when the parts are large, to use a blow pipe and direct the flame on the parts to be soldered. When the proper temperature is reached the aluminum becomes coated with an oxid of tin and zinc. When this coating is removed by a suitable instrument or brush, the aluminum surface is found to be coated underneath with a bright film of tin. The oxid should be removed while the aluminum is still hot and the tin in a melted condition. From this point on, the soldering of aluminum becomes as simple as that of tin, and two surfaces of aluminum previously tinned as above described, can be joined together, no especial solder being required. Any solder can be used that can be used on a tin surface, also aluminum surfaces so coated may be joined to other metallic surfaces with the proper solder and flux. The chlorid of zinc acts as a flux to remove the oxid of aluminum coating, thus leaving a large portion of the stannous chlorid to combine with the aluminum surface and deposit thereon a coating of tin, thereby obviating the necessity of the extra step of tinning where other than a stannous compound is used in coating the aluminum."

"LOVE'S LABOR LOST"

A Discussion as to the Advisability of Scratch-Brushing Plated Articles before the Plating Operation Is Complete.

By A. Parsons.

The following paper was read and discussed at a recent meeting of the Sheffield Society of Applied Metallurgy at Sheffield, England.

The three words which form the title of this paper are extracted from the following paragraph found in the well-known book on "Electro-Plating and Kindred Subjects," by W. H. Wahl, and which reads as follows: "The practice obtains among a few platers of removing their articles from the bath after they have received a thin coating of silver, thoroughly scratch-brushing, and returning them. It is questionable, however, if the advantages supposed to be gained by this practice are sufficient to warrant the extra labor, and to offset the risk of spotting the articles with finger marks. As one very experienced plater expressed himself to us on the subject, it is 'love's labor lost.'"

You will notice that the author speaks of the practice as only obtaining among a few platers. That may be true with reference to those of whom he writes, but our experience shows that it is quite a general practice here, and the contrary is the exception. It is then the purpose of this paper to examine the various points presented in this statement. (1) The advantages supposed to be gained by scratch-brushing after the spoons and forks have received a thin coating of silver. And here let me say we are dealing with spoons and forks only—those that come to the plater sand-buffed, and are to receive a medium or heavy deposit of silver. (2) The risk of finger marks in scratch-brushing. (3) The definite opinion expressed that the scratch-brushing under consideration is unnecessary and undesirable. The test we shall apply is that of experience, as we believe that every method or operation must be judged by the result it yields.

Forty-eight years ago I was engaged in what I think was probably one of the largest plating establishments in this city. The first method of preparing spoons and forks I remember to have seen there was as follows: The spoons and forks were wired, three or four on each wire, suspended in a tank containing boiling potash for about twenty minutes, rinsed through a dilute acid pickle, rinsed through water, dipped in aqua fortis, again rinsed in cold water, immersed for a few seconds in a quickening solution, rinsed again in cold water, and then given a rapid but thin coating of silver in the starting or striking vat. Having received this thin coating the spoons and forks were rinsed in cold water, and taken to a sink covered with a wooden casing. Here they were unwired, scoured with fine sand and water; next came the scratch-brushing process, then wired singly on hooks of copper wire, immersed for a few minutes in boiling potash, passed through a strong solution of potassium cyanide, from that to the quickening solution, then given a quick and very slight coating of silver in the starting vat, finally passed into the plating vat to receive the required deposit.

You will agree that this was an elaborate and painstaking process. With slight modifications the *modus operandi* I have just outlined was adhered to during the 12 years' experience I had in that establishment. Among the platers with whom I worked were both Birmingham and Sheffield men, and both were accustomed to the same method. After this long interval one cannot speak with certainty. Still remembering as I do that we were dealing with metal of good quality which contained a sufficiently high percentage of nickel, it is quite conceivable that much of the scratch-brushing was labor in vain. Twelve years later I experienced a great change. At that time I took charge of a small plating shop where there was only a treadle lathe for scratch-brushing purposes. This was very difficult to work, consequently the plater who preceded me had learned to ignore this antiquated piece of machinery, and to do his work efficiently without any mechanical preparation whatever. The woman in the shop explained his mode of procedure. I adopted it and found during the six months I stayed there that quite as good results could be obtained by a purely chemical treatment as by the additional aid of scratch-brushing. Before leaving this period I may remark that the heavier deposits were all done during the night time owing to the limited amount of vat accommodation and to the fact that the electric current used was generated by batteries. Yet in spite of these two drawbacks I do not remember any disappointing results to have occurred on that account. In view of this latter experience one is forced to the conclusion that to scratch-brush spoons and forks after coating is more a matter of choice than of necessity.

Time will not permit me to enter into a detailed account of the experience obtained during the last 35 years. Suffice it to say that they have afforded me ample opportunities for thoroughly testing and comparing the value of the purely chemical process with the more protracted one which includes scratch-brushing, and I am bound to admit that given certain conditions, which I will state presently, I am in favor of the simpler method. And now let us consider our first point, namely, the advantages supposed to be gained by scratch-brushing; and before we can decide what they are it would be as well to observe that all platers have at least one aim in common; that is, to secure a perfectly adherent and smooth deposit of silver upon the basis metal on which they are operating. I think it will be obvious to all of us that scratch-brushing spoons and forks after coating cannot increase the adhesion of the deposited silver to the basis metal, seeing that that is settled by the first coat. The same authority from which I have previously quoted has this remark on the subject: "The scratch-brush affords an excellent test of the quality of the metallic deposits; when good they are only polished by the friction, when bad they scale off from defective adhesion to the subjacent metallic surfaces."

I quite agree with this statement, and would point out that this as a test may be occasionally applied today when the operator is in doubt concerning the efficiency of the chemical operation. However, this would not justify anything like a general practice of scratch-brushing, as the plater would only need to subject a few spoons to this test to prove whether or no the rest were satisfactory. Having convinced ourselves that the adhesiveness of the deposit is in no way affected by scratch-brushing we will now consider the question of smoothness, and here I believe not a few platers are convinced that they secure a real advantage. But I am of the opinion that given a suitable basis metal, and satisfactory chemical preparations, there is nothing to be gained from the point of view of smoothness by scratch-brushing. Secondly, I think it will be admitted by all that the

risk of finger marks incurred by this process is a real disadvantage, and this is proved by having to pass them through the potash after handling. This difficulty is greatly increased during the hot weather, when even the potash bath sometimes fails to obliterate the finger marks.

I submit to you that there is probably not a plater present who has not ofttimes been annoyed and had his patience severely tried by this particular trouble. Now we come to the opinion expressed by this very experienced plater more than thirty years ago that scratch-brushing after a thin coating of silver is "love's labor lost." Of course, we must leave everyone interested in the subject to judge for himself. Every plater knows best under what conditions he works and what method suits him best. It is quite reasonable that you should expect an expression of opinion from me, as I have introduced the subject for discussion. Am I prepared to accept what is involved in the title of my paper? Taken just as it stands I must answer, No. The position is too much exposed to attack; but if I am allowed to fortify it by assuming the conditions which I promised earlier in my paper to mention then I am in agreement with the whole paragraph with which we started. The conditions are as follows: Supposing that we have a basis metal, that the spoons and forks are thoroughly buffed, they have no substance adhering which the potash will not easily dissolve, they are properly pickled, the dipping acid has done its work efficiently, the quickening has been satisfactorily performed, the coating in the striking vat is all that could be desired, and the spoons and forks after being in the plating vat a few minutes satisfy the critical eye of the plater, giving not the slightest indication of requiring brushing. In this case I say brushing would be labor in vain.

One word as to the basis metal (German silver). I regard the test as to whether it will plate satisfactorily or not without brushing as an important one from the plater's point of view, and although I would not say it is the one thing needful, I would certainly say it is one of the needful things. Let us in imagination set two platers the task of preparing and plating two dozen spoons each. They are wired, and the men immerse their spoons in the potash; and when thoroughly cleaned they pass them into the pickle, dip them in the aqua fortis, and then into the quickening solution. So far our men have traveled together; but now, their plans being different, they part; the one intent on brushing his spoons gives them a rapid and rather strong coating of silver, rinses them in water, and passes them on to the scratch-brusher. Our other man, intending his spoons to pass from the starting vat, coats them very lightly, glances at them to see if the coating pleases his eye, and if so passes them into the plating vat. When they have been in the plating vat a few minutes he draws them out of solution for a final examination, and if the appearance of the spoons is entirely satisfactory, the plater knows they could not be improved by scratch-brushing. In the meantime, our other plater has got his spoons brushed; he probably rinses them through the potash, cyanide solution, quicking solution, gives them a coating in the starting vat, passing them into the same plating vat as the first two dozen. Now supposing both lots come out when finished equally good in every respect, supposing they stand the burnishing test equally well, and when quite finished the unbrushed spoons look quite equal to the brushed ones, and have taken no more time in polishing, I think we must decide that the man who omitted the brushing has decidedly the better case.

In conclusion, we may say that in the case of German silver especially science and practice have furnished us with most excellent chemical preparations—alkalies for cleansing, a large variety of acid mixtures for attacking the surface of the German silver without injuring it for plating purposes, quick solutions which may be varied in strength as experience directs. Therefore if we make a wise choice of these chemicals and use them judiciously then I say we may safely trust the purely chemical treatment in the future more than we have hitherto done. If you will permit me, Dr. Hutton, to adopt for one moment the attitude of adviser I will conclude by saying to the younger men in this audience, "Accept with avidity any new suggestion concerning your work which permits you to say 'Let me test it.' And let every experience in life educate you."

A long discussion followed.

Mr. W. R. Barclay said he would agree with Mr. Parsons if the conditions which he had mentioned could be obtained, but in actual workshop practice they often found that of a large number of articles which had all been cleaned the same way a number of them would "dip black," and for this they could not account. No man in the plating shop could quite tell why they had "dipped black." "I think," added Mr. Barclay, "I should earn the gratitude of the majority of the platers in this room if I could solve that problem."

Mr. F. Hodkin thought that every article ought to be thoroughly grounded with scratch-brushing to a certain extent. He considered that scratch-brushing was a necessary adjunct to the work, and he was strongly in favor of its being retained.

Mr. C. Puttrell: "Does Mr. Parsons mean that a spoon and fork do not need any brushing at all?"

Mr. Parsons: "Yes, that is exactly what I do mean."

Mr. A. Jefferson said he was a firm believer in a thing which had been chemically cleaned being cleaner than an article that had been mechanically cleaned. He quite thought that chemicals were cleaner even than the ladies in the shop. (Laughter.) And if it was possible—and he was not prepared to dispute the possibility of it; in fact, he rather supported it—to get an adhesive deposit, a heavy deposit, on a spoon or fork without the labor of scratch-brushing he was quite sure that they would get a better article and they would save labor. At present he was putting grosses of work through which never smelt a scratch-brush, and that not only applied to spoons, but it applied also to wire work, hollow ware.

Mr. Frank Mason spoke of having seen for some considerable time past work which had been got through without scratch-brushing and it had stood the ordinary tests.

Mr. G. B. Brook held that in the case of metals other than silver, such as brass and copper, scratch-brushing would be necessary.

Mr. A. Nicholl observed that a great deal of work in America was done without scratch-brushing, but he said he could never understand how they got over the difficulty of the wire mark if no scratch-brushing was done.

Mr. A. Leonard declared that if they were doing work for the trade it was quite out of the question to do it without brushing it.

Mr. A. Bowker was of opinion that before they could plate according to Mr. Parsons's method the conditions would have to be absolutely perfect. Any plater to the trade knew that in that branch they got things to plate with impurities that potash would not remove even in a few days, let alone in a few minutes, and it would be absolutely impossible to plate those things without the process of scratch-brushing. Also he was inclined to agree with Mr. Brooks that after a certain time a deposit became rough. Still he believed that given the conditions which Mr. Parsons had specified there was nothing whatever to be gained from scratch-brushing. But his own personal experience as one engaged in plating to the trade was that he never did anything without scratch-brushing it. Several other speakers spoke of the difficulties in the way of not scratch-brushing.

Mr. A. A. Parsons, however, said it was amusing to hear people speak of the difficulties against doing work without scratch-

brushing. He knew perfectly well that such work was done without scratch-brushing. He knew of one firm who sent out thousands of dozens of articles which were never scratch-brushed.

Mr. A. Parsons, in his reply to the discussion, pointed out that in his paper he had referred only to articles with a thin coating. He had seen satisfactory results obtained with hollow ware which were not scratch-brushed. Mr. Parsons added that he had been working for forty-eight years. He began when ten years of age. And he did not think there was anyone present that night who had had as long an experience of the two methods with which he had dealt that night. In his opinion they would not find a single writer on the subject of electroplating who advocated scratch-brushing after coating unless there was an unsatisfactory appearance of the goods in the vat which indicated that they must be brushed. But with that exception, as far as he knew, there was not a single writer who advocated scratch-brushing after coating.

CARBORUNDUM COMPARED WITH EMERY IN THE POLISHING ROOM

By Franklin W. Hobbs.*

FRANKLIN W. HOBBS.

Probably not every polisher in the land has become acquainted with carborundum, while not a few, after giving it a limited trial, have discarded it. If cutting qualities were the only ones to be considered I feel perfectly sure that no polisher who gave it even the slightest trial would ever go back to emery. There is, however, one disadvantage which one and all find, namely, the difficulty of making the grains stay on the wheel. I well remember my first experience with carborundum, I was amazed at its vastly superior cutting qualities, but extremely disappointed when I discovered that it was fast parting company with the wheel. However, having satisfied myself of its cutting properties, I was unwilling to abandon the use of it at once, so began experimenting. Glue was run both light and heavy, then it was allowed to get "tacky" before rolling in the carborundum. Different kinds of glue were tried, and so on through all possible conditions and methods of applying abrasives to a wheel. In the end the best results were obtained with a good quality of glue run medium, heavy and hot. An examination of the little sharp, sparkling crystals, under the microscope, beside the comparatively dull appearing emery grains, discloses the cause of the difficulty in making the former stay on a wheel and at the same time impresses one with the fact that a sharp cutter must necessarily be a difficult one to hold. I refer to the extremely smooth surface of the crystals.

During the experiments in setting up wheels the real secret of successful use of carborundum was discovered. Lighter pressure on the work is the secret. The best results are obtained on carborundum when only about two-thirds the pressure is applied, that would be necessary if emery were the abrasive. It is a significant fact that polishers accustomed to using emery apply fully one-third more pressure to their work than those using carborundum. I have recently proven this in the following manner: A spring scale was hooked to a post behind the workman, the other end being made fast to a piece of work in such a way that it would just clear the wheel when a stroke was made as on the wheel. Several workmen were tried and the scale read, resulting as above stated. By this reduction of pressure it will be found that the carborundum will stay much longer upon the wheel and it will cut as long as there is a particle left.

A firm of well-known wheel manufacturers make the following statement, which I find to be absolutely true when applied to wheels set up with emery: "There is no standard speed for polishing wheels, the limit of speed is the melting point of the glue and the glazing point of the emery. This can only be determined by experiment and will vary in different shops and under different conditions." Now as melting (or burning, as we call it), of the glue is due to heat resulting from pressure, the reduced pressure on carborundum obviates the burning and the attendant gumming; and as for glazing, the word has no application to carborundum. With emery it is grind and glaze, with carborundum it is cut and cut again. With emery, as it becomes dull, the polisher applies more pressure, which burns the glue and sometimes, in the case of felt, the wheel also. A slightly increased pressure on carborundum causes the grains to break, forming new cutting edges. A softer cushioned wheel can be used with carborundum owing to the lighter pressure employed, and this, in the case of irregular shapes, gives a better job and more comfort to the polisher.

I made a positive test of the comparative values of carborundum and emery, and the results have been confirmed through a dozen or more years of constant use. Two lots of wheels were selected of precisely the same size, kind and condition. One lot was set up with emery, the other with carborundum. Several men were given a certain number of pieces of the same kind of work. Each did one-half of the pieces on emery wheels and the other half on carborundum. The time was kept and the amount of carborundum, glue, emery, and number of wheels was recorded. The results showed a use of only four-sevenths as many wheels and a corresponding reduction in glue and abrasive when carborundum was used, with a reduction in time of more than twenty-five per cent.

Objection has been made to the decidedly high price of carborundum. In my investigation I found that approximately one pound of carborundum was consumed in nine hours by one man in grinding and fining, while somewhat less would be used on oil wheels and a little over one and one-half pounds of emery was used in the same length of time, so that the cost of abrasive was approximately twelve and six cents respectively. But when we consider that about two and one-fourth hours' time was saved by the substitution of one pound of carborundum for one and one-half pounds of emery, we find that at a conservative estimate of the cost of labor, a keg of carborundum would yield over one hundred dollars more profit than would have been the case with a keg of emery. To these favorable results must be added the reduced strain and wear on belts and lathes resulting from the decreased pressure on work and wheels. Also saving in time and glue in setting up wheels. So that in summing up it must be admitted that the price is no objection whatever, and if carborundum were three times its present price it would be much the cheapest in the end.

*Foreman Plater, Wood and Bishop Company, Bangor, Maine.

THE REVIVAL OF HANDMADE JEWELRY

By Isabelle M. Archer.

In the art of the Egyptians and Etruscans we find the source from which the Greeks derived their knowledge of the making of gold jewelry, and the exquisite work done by the Grecian artisans forms the basis of the art of the Italian jeweler of the Renaissance. But not since the Venetian goldsmiths and jewelry workers designed their masterpieces has the art of the jeweler reached such perfection as it has during the opening years of the twentieth century. The cause of this revival of the jewelry art has been chiefly due to the interest taken in the designing of handmade jewelry by artistic designers and the superiority in craftsmanship of handwork over machine made jewelry.

In ancient times when the workers passed the knowledge of their art as a legacy from father to son, and the love of the work was inherited, a lifetime was spent in the learning and perfecting of a chosen branch of the art of jewelry making. The delicate tracery and fine wire work of the Greeks could never have been formed except with the utmost patience, and the skill shown in the use to which the materials were put speaks of the natural artistry of the worker. Later, in the workshops of the Renaissance, from the first dividing and beating or pulling of the gold to the burnishing and the stone setting of the finished article the work was actually done by the same pair of hands. In the studios of the great designers, where the jewelry was made by under workmen, the master superintended every step and each separate piece was duly passed upon by him, but the entire piece was completed, from first to last, by the same artisan, thus insuring continuity of design and workmanship. It was just this union of the parts that has been entirely lost in the jewelry made by machine. In the hand wrought jewelry of the present we see a return to the old methods, and consequently more perfectly made and more artistic jewelry.

The peasant jewelry of Europe reflects today the work done for generations in out-of-the-way places, and affords fine examples of handwork. It was principally through the interest taken in this jewelry by the artistic designers and the work done by them, in imitation, that the revival in handmade jewelry had its beginning. This new movement does not comprise the latest fad, for the new ideas have raised the standard in the jewelry makers' art, and the improvement has come to stay. Starting in France with that much abused Art Nouveau it has spread throughout Europe steadily, and within the last few years has made a permanent stand in America.

The chief difficulty at first was to produce good work that would pay. Artistic designers who worked for the sake of the art and the dilettante could afford to spend much time on the designing and making of one piece, but it was another matter to commercialize this handwork. The artisans of the present day are not ordinary piece workers. They now make the jewel from beginning to finish. They are careful, conscientious workers and are high-priced craftsmen. Much more time is needed in making the hand-wrought jewelry than is put into the usual jewelry of commerce, which raises the cost of production, and this, at the start, in the face of uncertain demand.

The original shops of the modern school were, until very lately, run at a decided loss, and not until the large jewelry firms were convinced of the stability of the movement and saw the ever-increasing demand for the artistic handwork did they endeavor, themselves, to compete with the new firms, and then only by starting small departments of workers in this line. Now the business is growing steadily for handmade jewelry and is in ever-increasing demand.

GREEK AND ROMAN RINGS AND EARINGS.

EGYPTIAN RING AND PENDANT.

MARTIN LUTHER'S WEDDING RING.

AN ITALIAN RENAISSANCE PENDANT FROM THE SOUTH KENSINGTON MUSEUM.

France is the center and the heart of the revival. Fashions in jewels, like fashions in gowns, originate in Paris, and from that city emanates the strength of the movement. The greatest of all the modern artists is Rene Lalique, of Paris. He is the father of the revival, and the master designer has a large following both in Europe and on this side of the water. The return to the handmade jewelry has brought into use the old time methods of treating the metal framework and setting of jewels. Much more is made of this part of the work, and in some pieces the artist relies more on the metal work to hold the attention and give interest to the design than he does on the stone.

Chasing, carving, engraving, repoussé and filigree work are used on the handwork and beautiful designs are made of gold wire. Silver is used for the mounting of semi-precious stones, and gold combined with silver is seen in some clever work. Very beautiful enamel work has been done by the best jewelry makers, and is

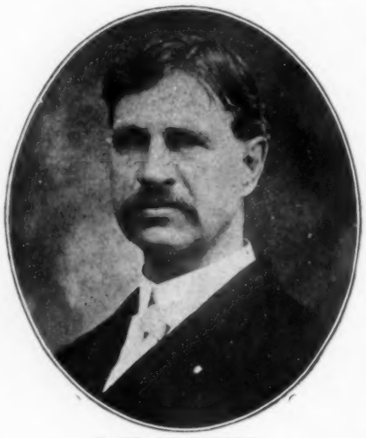
becoming more popular every day. Precious and semi-precious stones are used to great advantage with enamel work, and gold wire shows enameling off wonderfully. The remarkable taste and discrimination in the selection of stones, the great variety used and the method of placing them in the finished design are characteristics of the modern designer. Semi-precious stones, especially, are used with fine feeling, and irregular shaped stones are utilized without cutting, thus often retaining the best part of the stone and preventing its entire disfigurement.

Comparatively few diamonds are used in handmade jewels, and a great variety of polished, but uncut, stones are replacing the highly cut ones of the old commercial jewelry. The machine made jewelry with the bright, sparkling gems, could never be considered as a work of art, no matter how elaborate or expensive, but now, with the great care and artistic feeling shown in the designs and the great skill with which the pieces are made, even the baser metals combined with only semi-precious stones make admirable works of art. Outside of the personal ornaments the trade has felt the improvement in designing of such objects as crosses and altar fixtures, caskets, cups, silver vases and a great number of other articles. The influence on the entire field of craftsmanship that the revival in handmade jewelry designing has shown is also most notable. Clocks, furniture and house decoration and all lines of ornamental metal work have shown decided refinement, and the improved artistry acknowledges in an unmistakable manner the art of the jeweler.

CLEANING METALS

A Discussion of the Modern Methods for Preparing Metals for Plating and Finishing Operations.

By B. W. Gilchrist.*



B. W. GILCHRIST.

In methods of cleaning metals for plating, as in the politics of today, there are standpatters, progressives and insurgents. Standpatters, or reactionaries, as they are sometimes called, still preach the doctrine of twenty years ago, and maintain that so long as a deposit is adherent, there can be no reason for evperimenting with new-fangled ideas, and paraphrase the standpat politician's motto to read: "What is god enough for Roesleur is good enough for me." They point with pride to the plank in their platform (Langbein folio 131, 'Removal of grease), which proclaims caustic potash and lime the only desirable and regular way of procuring a plating surface. While admitting that good deposits are obtainable by these methods, progressives contend that in numerous instances these cleaners should be "recalled," and newer, quicker and less laborious cleaners adopted. They demand the cleaning of iron and steel by electricity, and the abolition of potash entirely in the treatment of brass and copper. Their hat is in the ring, and the party is gaining rapidly numerically. They claim that with the cleaners now on the market to have reached an "Alabama" in the hunt for a correct solution of all cleaning problems.

One step in advance, we find the insurgent demanding entirely new solutions and complete elimination of both caustic potash and lime on all classes of work handled by the plating department. They believe in the education of the masses of platers. They have no fixed program, but are determined by some method to clean work with less, or without any labor. That their aims are tenable they insist, and as a final argument point to the unending chain of circulars and booklets that find their way into their department, from those whose work it is to cater to this end of the business. Some of these lie before me as I write and many are advertised in The Metal Industry. The concensus of opinion seems to be that no one cleaner is superior to all others on all classes of work. The cleaner giving the best results on iron and steel may not be suited for brass and copper, and the same is true on highly polished surfaces and those with a rough finish. It may be found advantageous at times to use two cleaners on one article to obtain quickest and best results.

It is purposed in this article to mention but a few salts that have been found suitable on the class of work handled and give the results obtained after many trials and various conditions. Reactionaries who refuse to see the advantages of electric cleaning will probably bolt when the statement is made that iron and steel should always be cleaned by electricity, and that the day has passed when work should be scrubbed with sand or pumice under any conditons. To promote harmony, therefore, let us first consider our old familiar friend, potash.

Caustic Potash, especially where iron castings, received in a filthy condition are to be plated, is still of great value. Where mineral oil has been freely used; also on unions that come direct from the tester, covered with oil and dirt and on stove work with buffing compounds incrusted in the deep recesses, it is what the Cascaret is to humanity. A solution containing caustic potash, 8 ounces; water one gallon, and cyanide potassium, ½ ounce to each ten gallons is preferable. This solution should be kept at almost a boiling point and a current with a strength of 5 volts used. As the cleaning progresses the dirt and oil which float in large quantities should be skimmed frequently with a board. Never use a piece of metal, as it is apt to come in contact with the tank and the work, thus forming a short circuit, which will cause the grease to explode with considerable force, which is rather an unpleasant experience. While in most cases the work will be chemically cleaned in this solution there is always a chance of some small particles of grease adhering to the work and to be absolutely sure of good results a second cleaning after rinsing in water will remedy any defects of the first cleaner. This second cleaner may be made of electric cleaning compound.

ELECTRIC CLEANING COMPOUND.

This is made in Ohio. It, like Ohio Republicans, is a progressive cleaner. It is easy to handle, works quickly, and does not tarnish polished surfaces, for which it is

*Foreman Plater, Kelly & Jones Company, Greensburg, Pa.

best adapted. On iron and steel the solution should stand 5 degs. Baumé. Temperature and current as given for cleaning with potash. From figures furnished by the manufactures about 60 per cent. of those using this cleaner are progressives, and 40 per cent. insurgents, who claim this and all other electric cleaners, except cyanide, should be worked with a reverse current. This 40 per cent. claim to be from Missouri on this matter. Besides being a satisfactory cleaner on iron and steel, electric cleaning compound gives excellent results on polished brass and copper, by using it with less heat, strength, and current than when used for iron. But where the article is undercut with a rough background which holds the polishing powders will not always work unfailingly. So a preliminary cleaner should be employed to loosen up the caked grease. This can be quickly done with a solution of mineral cleaner.

MINERAL CLEANER.

This salt, while comparatively new, has won many converts, for while possessing the good qualities of potash, it has none of its faults. It works quickly without hurting polished finishes, does not injure the hands, and requires very little attention. It is cheap, and, unlike potash, is unaffected by the action of the air when left uncovered. An electric current is not needed, but it will be found advantageous to have a frame above the tank, which will furnish motion to the work while cleaning. Should there be any doubt regarding deep unfinished parts, it is advisable to give the work a second cleaning in the electric cleaning compound solution.

While this may be deemed superfluous by many, it is much better in plating, as in other things, to be sure, than sorry, especially if trouble can be thus avoided.

While the foregoing solutions are satisfactory for the metals designated, they cannot always be depended on for plating nickel on nickel, as will sometimes be necessary, where work has been cut through, or damaged by rough handling after buffing. In such cases, after using the cleaner described above, the work may be brushed with a paste of air-slaked lime in water to which may be added a few grains of phenol-phtalein (this is especially recommended to Socialists who adopt this method); in fact, lime is a fine cleaner for brass, a quick and sure way of obtaining a plating surface, where rods or tubing (which are too long to admit of immersion) must be handled. This also applies to work having parts or letters japanned which must not be softened in cleaning. Benzine and gasoline should never be used for cleaning, as the solutions given above can be made to produce desired results, at a less cost and without the danger which attends their use. The following rules will be found to work on most cleaning solutions:

1. Keep up the strength by adding small quantities of salts each night.
2. When a cleaner works badly, apply the initiative, referendum and recall.
3. If your electric cleaner won't work with a direct current, be an insurgent and reverse your current.
4. Try making your last dip on iron and steel—hydrofluoric acid, as you do cyanide on brass and copper.
5. Too much current in a cleaner will spoil the finish on brass; the same applies to too much heat.
6. If you can't get results with these cleaners, apply the steam roller; it's popular at present.

LAPPING OF HARDENED STEEL DIES

A Description of How to Obtain a Bright, Mirror-Like Surface on Metal and Coining Dies and the Like.

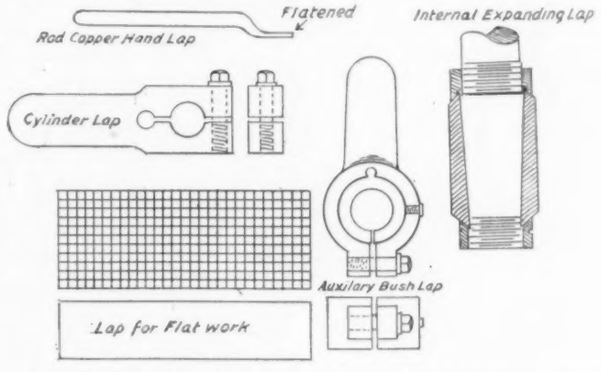
By Easy Way.

When lapping is resorted to it always means working to a limit of .0001 part of an inch or finer. And unless the operator has had considerable experience in this particular work he will not obtain the best results at first, but patience and practice makes perfect. A bright, mirror-like surface cannot be produced on a soft piece of steel, therefore all lapped work must be hardened and then ground, and the utmost care should be taken while grinding the surface left by the emery wheel, which will consist of a series of small ridges, or irregularities. Therefore, the depth of these must be allowed for in finishing or "lapping."

From experience, the operator will learn that it is advisable to use fine grain emery on large work. As if the piece being lapped is heavy it will pulverize the particles to the consistency of flour emery and thus speedily produce a finished surface with a lubricant of coal oil or benzine, and using a lap composed of cast iron as per sketch or to suit the requirements.

For small work use flour emery and the same lubricant, gradually allowing the lap to become dry, and this in itself will produce the required polished surface. When lapping a surface to a true flat, the article must be moved as though producing a figure 8 and at the same time made to revolve slowly.

The speed used for lapping round work should equal the travel of a drill for that size hole, and for flat work about the same as for planing. As stated previously, experience and good judgment are the most essential factors in this class of work. No fixed standards can be adopted. Since all steels do not harden alike, and this being a fact, there is always a different grain in the steel which is exposed when the surface is perfectly lapped. For flat work a very good lap can be made from a flat plate of cast iron. The surface planed smooth and flat; then cut a series of grooves to form squares. These grooves are cut with a V-shaped tool and about ¼ of an inch apart by 1-32 of an inch deep. The grooves catch the emery and feed it to the work being lapped and with an even pressure using the action previously described accurate results should be produced. The other style of laps shown are self-explanatory.



VARIOUS STYLES OF LAPS USED FOR HARDENED STEEL DIES.

EFFECT OF THERMAL CHANGES ON LEAD-TIN ALLOYS

By William P. Munger.*

When two substances are mixed, one of three things, or a combination of these, results: 1st—The two substances do not act upon each other, they retain their original properties and by suitable treatment this mechanical mixture can be separated into its components. Carbon and iron filings make such a mechanical mixture. 2nd—The substances may act upon each other to form one or more substances with new properties, thereby producing a chemical reaction. 3rd—One substance will dissolve all or a part of the other, making thereby a solution of one substance in the other. An example is salt in water. This differs from the first case in that while each substance has not lost its identity, and can be separated and recovered unaltered by a suitable process, the properties of each constituent are altered when in solution by the presence of the other, and often the solution possesses properties possessed by neither of its constituents. When the solutions are made by mixing two or more metals, or their combinations, the solution is known as an alloy.

When any one of the series of alloys, starting with pure lead as the solvent and ending with pure tin as the solvent, is melted to a thin fluid, and allowed to cool, the same phenomena are exhibited as when a solution of salt in water is cooled down past its freezing point. If, when the alloys are in a thin fluid, we introduce a previously warmed thermometer into the mass, and let the crucible and charge cool slowly, the fall of temperature will be quite regular at first, but abruptly the mercury will cease to fall, and if the mass was superfused, that is, cooled lower than its freezing point, the mercury will rapidly rise to the true freezing point, the temperature will remain stationary for some little time and then begin to fall regularly. If the metal used was pure, or contained less than 8 per cent. or more than 95 per cent. tin, the temperature will fall continually until the room temperature is reached. As the rate of radiation from the crucible and charge was continuous and decreasing, heat must have been obtained from the only source possible, the charge itself, to maintain the constant temperature. If the mass is examined just after this point of stationary temperature has been passed, it is found to be solid. In changing its physical state or phase, the mass had given off heat and remained at a constant temperature until that heat was dissipated. If the alloy contained between 8 per cent. tin and 95 per cent. tin and perhaps beyond these limits, another phenomenon is observed. The molecules of tin and lead attach themselves to each other to form a third substance, which as it has a lower solidification point than either of its components, asserts itself as solvent for the excess of either of its components. When this substance solidifies, there is a disengagement of heat similar to that previously observed.

The temperature changes observed on cooling lead-tin alloys are graphically presented in Fig. 1, which shows a selection from the observed solidification curves for a series of alloys made from commercially pure metals in the laboratory of the Stromberg-Carlson Telephone Manufacturing Company. The end curves are for lead and tin, respectively, and the intermediate curves for alloys varying by 10 per cent. of tin (Sn), from pure lead to pure tin. The thermometer bulb only was immersed in the alloy and readings were taken every 15 seconds through the range 640 degs. F.-300 degs. F., and so plotted that the horizontal lines of the figure represent a difference of 20 degs. F. and the vertical lines of one minute. To avoid confusion all but the first of the curves were plotted with the time 0 successively an even number of minutes to the right of the 0 of the preceding curve.

Since, at the first disengagement of heat the excess of tin or lead changed in phase or state from liquid to solid, and at the second disengagement of heat the solvent of

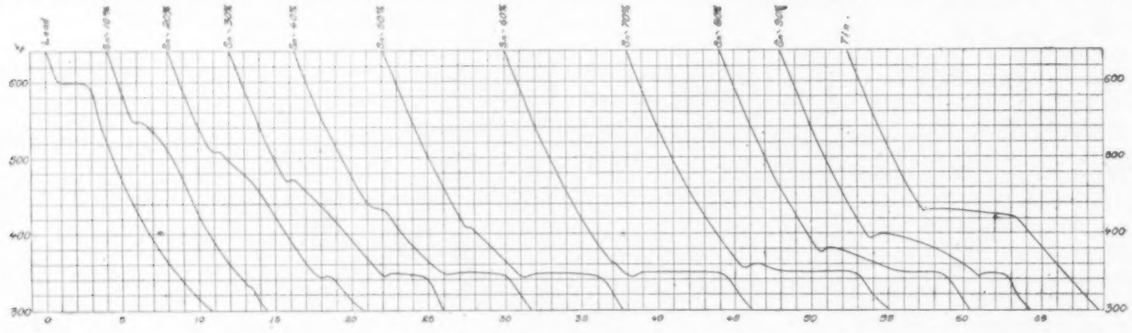


FIG. 1. GRAPHIC REPRESENTATION OF TEMPERATURE CHANGES OBSERVED ON COOLING LEAD-TIN ALLOYS.

low melting point changed in phase from the liquid to solid, it is evident that between these points the mass would consist of a mixture of solid substance, probably in crystal form and liquid. When this liquid solidifies, the crystals must be imprisoned and surrounded by this substance of low solidification temperature, and so this structure can be proved by examining the polished and etched section of the cold alloy with the microscope.

By plotting the points of stationary temperature as given by the cooling curves of a large number of alloys containing the same metals but in different proportions, a freezing point curve for the system will be obtained. Such a curve for the lead-tin system is shown in Fig. 2. The successive horizontal lines represent a difference of 20 degs. as in Fig. 1, but the vertical lines represent a difference of 10 per cent. tin from pure lead on the left to pure tin on the right.

If a record of the temperatures had been made while any given alloy was being heated, it would have been found to have stood still at practically the same point as that which would be obtained when that alloy was cooled down. This halt of the rising temperature is due to heat absorption caused by the alloy changing from the solid to the liquid phase or state. It can thus be seen that for all practical purposes the melting temperatures and the freezing temperatures of metals and alloys are identical, and that with reasonable accuracy the melting points of the lead-tin system can be inferred from the freezing point curves given in Fig. 2. In other words, the curves in Fig. 2 mark the temperature at which there occur

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transitions from the solid to the liquid or the liquid to the solid phase.

An inspection of Fig. 2 shows that the upper transition point is continually lowered by the successive additions of tin to lead, until 68 per cent. tin has been added and from this percentage to pure tin the transition temperature gradually rises. This alloy having the minimum transition point has been named by Dr. Guthrie "eutectic," a word of Greek derivation, meaning easily melted. As has been shown, the eutectic persists from 8 per cent. to 95 per cent. tin and perhaps farther. The eutectic transition temperature is usually given as 180 degs. C. (=356 degs. F.) and its composition as corresponding to the formula $Pb\ Sn_{3.3}$. Its freezing point is apparently depressed by the addition of either tin or lead, particularly by lead. This apparent depression may be due to the hindrance to the heat radiation or absorption caused by the excess of solution.

Although the Roman Pliny, who died in the year 79, recorded that it was impossible to solder lead without tin,

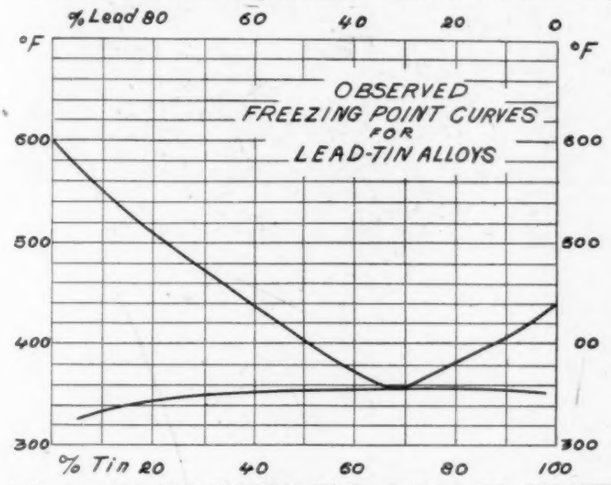

FIG. 2. OBSERVED FREEZING POINT CURVES FOR LEAD-TIN ALLOYS.

or tin without lead, and, although he advised an alloy of one part tin and two parts lead, a mixture in use to this day, for the joining of lead pipes, reasons for one tin and two lead being the best mixture for wiping have perhaps never been presented. Returning to Fig. 1, it is seen that as the proportion of eutectic increases from either direction from the ends, the length of time required to pass the solidification point also increases. Between the two solidification temperatures, as pointed out above, the alloy is a mixture of crystals of the excess metal and the fluid eutectic. In this condition the alloy is somewhat like stiff clay, and it is owing to this plastic condition that the plumber is able to make a wiped joint, and the longer the plastic condition persists the more thoroughly the plumber can wipe the joint. Consistent with this, the temperature at which the solder changes from liquid to plastic should be low and the transition quick.

By plotting the times taken by the first disengagement of heat so that the vertical lines represent the changes in composition, as in Fig. 2, and the horizontal lines represent units of time taken for the disengagement (in this case minutes), the curve shown by dotted line in Fig. 3 is obtained. The time of solidification of the eutectic is similarly plotted and shown by the dash line. The interval between the end of the first point of stationary temperature and the beginning of the second is shown by the dot and dash line. As has been pointed out, the alloy is a mixture of crystals or solid, and fluid, from the end of the first to the beginning of the second point of stationary temperature. Now, since the second stationary temperature is an evidence of change from fluid to solid, it is evident that the mixture of fluid and solid must persist to the end of the stationary temperature. The alloy then is a mixture of solid and liquid from the end of the first solidification to the end of the second, and is in the plastic conditon during that time. This interval of plasticity is plotted in full line and marked "Plastic" in Fig. 3.

An examination of Fig. 3 shows the maximum time of plasticity to be at 33⅓ per cent. tin, and the excess metal to be at the minimum time of solidification, the interval between the two points of stationary temperature to be nearly two-thirds of the maximum, and by reference

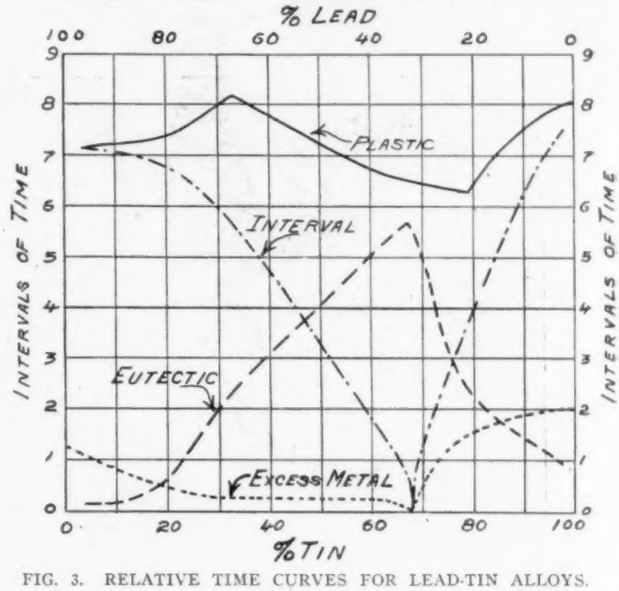

FIG. 3. RELATIVE TIME CURVES FOR LEAD-TIN ALLOYS.

to Fig. 2, the transition temperature to be about halfway between the eutectic and pure lead. Thus it is shown that Pliny's proportions, one tin and two lead, give the best solder for wiping lead-pipe joints. By a similar inspection of the curves the reader can readily determine what lead-tin alloy will have the properties best suited for his purpose.

ANTIMONY IN BEARING METALS.

By using the cathode described below, antimony can be accurately determined without, in most cases, filtering the solution before electrolysis. 1 gramme of the alloy is dissolved in a mixture of 4 c.c. of concentrated hydrochloric acid and 4 c.c. of nitric acid of sp. gr. 1.2 in a covered beaker, and after expelling the nitrous fumes, the cover is rinsed with 5 c.c. of water, the solution is neutralized, then treated with 10 c.c. of sodium hydroxide solution of 43 degs. B., 80 c.c. of sodium sulphide solution of sp. gr. 1.225, and 6 grammes of potassium cyanide. After boiling for 5 minutes, the walls of the beaker are washed down with 20 c.c. of water and the solution is electrolyzed, preferably over night, with a current intensity of 0.1 ampere. A coil of platinum wire is used as anode, whilst the cathode is formed from a piece of sheet platinum (13 cm. by 9 cm.) to which a platinum wire is autogenously soldered. Slots in the sides allow of free diffusion of the electrolyte. An adherent deposit of antimony is obtained, which is washed with water and alcohol, without interrupting the current. —From the May 31 issue of the Journal of the Society of Chemical Industry.

THE NEW YORK ASSAY OFFICE

The United States Government has located and put into operation at 21 Pine street, New York City, one of the most complete and up-to-date gold and silver refinery plants in existence. The New York plant in a sense takes the place of the one until recently operated in Philadelphia, Pa. The refining part of the United States minting plant at the latter city having been discontinued and the working force from chief melter and refiner down has been transferred to the New York establishment. Here, in commodious and well-lighted quarters, equipped with the best of modern machinery and using the most up-to-date and approved methods for the handling of precious metals, the work goes on smoothly and effectively. Every little detail in the work of accounting for dollars and cents in the value of the material handled is most carefully and systematically done. The work of the New York office is summed up in a few words. Gold and silver are bought in whatever form presented either bricks, coin, jewelry, plates, etc. The gold is separated, refined and sold as bullion, the silver is also separated and refined but is not retained or sold by the government only in special cases. As a rule the silver is returned in the form of bullion to the customer who brings in the metal. The office will also refine your gold and charge you only a small price for the process. No ores are assayed at the office and no metal is accepted that does not contain less than twenty per cent. of silver and gold.

When metal containing gold and silver is presented at the assay office it is weighed and a receipt showing the gross weight is given to the party submitting the metal. This receipt merely states that so much metal in weight has been received at the office. Three days later the customer may call and get the money value of the gold in his deposit together with the silver it contained in the form of a bar. Should the metal deposited contain other metals such as platinum palladium, osmoiridum, etc., the depositor does not get anything for these metals, they become the perquisites of the office and the sale of such metals nets the office usually $100,000 per year. A depositor, as said above, may also obtain his gold in bar form and then has to pay a small charge based on the actual cost of refining, etc.

After a deposit of metal has been made it is taken, tagged with a number or name of the depositor to the melting room, as shown in the picture, Fig. 1. Here it is placed in a graphite crucible and melted down to ingot form in an oil-burning furnace. The ingot is then sampled by drilling and the drillings are assayed by two assayers who work independently of each other. The assay room is shown in the illustration, Fig. 2. The results of the assays are what determines the basis for settlement with the customer and he is paid accordingly.

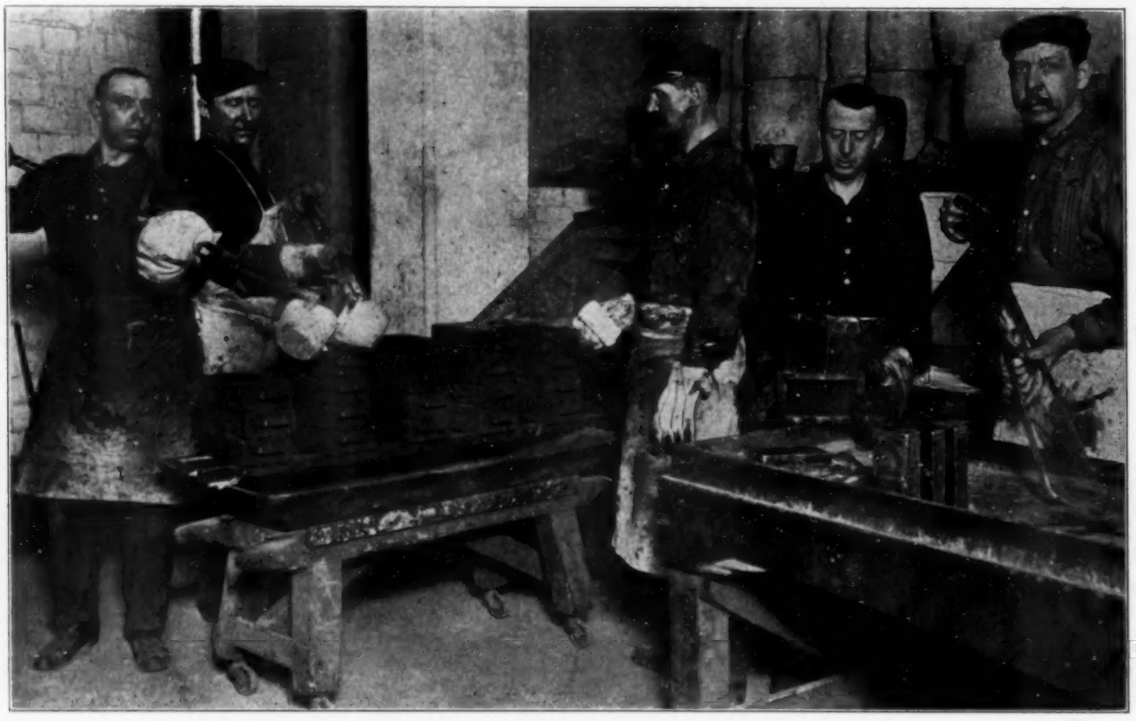

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FIG. 1. ONE OF THE MELTING ROOMS IN THE NEW YORK ASSAY OFFICE. FURNACES INSTALLED BY THE W. S. ROCKWELL COMPANY, NEW YORK.

The rough cast ingot is now ready for the refining process. The ingot is taken to a second melting room similar to the first and melted with proper mixing and fluxes and then poured into a mold of iron which produces an ingot in the form known as an anode. The anodes as now used will approximate 400 ounces of gold, 500 ounces of silver and 100 ounces of base metal (copper, lead, etc.) in each 1,000 ounces of anode. The anode it should be mentioned is cast with a hole in one end to facilitate handling in the bath.

The gold-silver-base metal anode is now hung in the side of a stoneware tank, as shown in Fig. 3, holding upwards of one hundred gallons of solution, and connected with the positive pole of an electric circuit. Thin sheets of rolled silver are hung in the center of the tank as cathodes and are connected with the negative pole of the circuit. The solution used in the bath contains about two per cent. of silver nitrate and two or three per cent. of free nitric acid. The current is turned on and the silver is carried out of the anode and deposited onto the

cathode. The base metals in the anode copper, lead, iron, etc., go into the solution, while the other precious metal present, such as platinum palladium, etc., remain in the solid form with the gold. When the process has proceeded so that the now gold anode is about 930 fine the anodes are taken out of the tank and are ready for the gold-refining process. The anodes are enclosed by a bag during the silver depositing to prevent small particles of the gold dropping to the bottom of the tank without separation. When the solution in the tank becomes foul, it is run out of the tank and further treated for the recovery of the copper-lead, etc. The copper is usually thrown out as cement copper with iron and used over again for the manufacture of anodes. There is now hydrochloric acid. The anodes are again connected to the positive end of the electric circuit and thin sheets of pure gold are hung from the center on a rod connected with the negative wire. A current approximating 200 amperes to the tank is used here and the gold is deposited in a degree of remarkable purity, there being only about two-tenths of an ounce of impurity in ten thousand ounces of gold produced. The gold cathodes are then washed, dried and sent to the melting room where they are remolded into the bars needed by the customers of the assay office. This gold is used mostly for coinage and for the manufacture of jewelry.

The anodes are bagged here as well as in the silver process and in this case there is practically nothing left

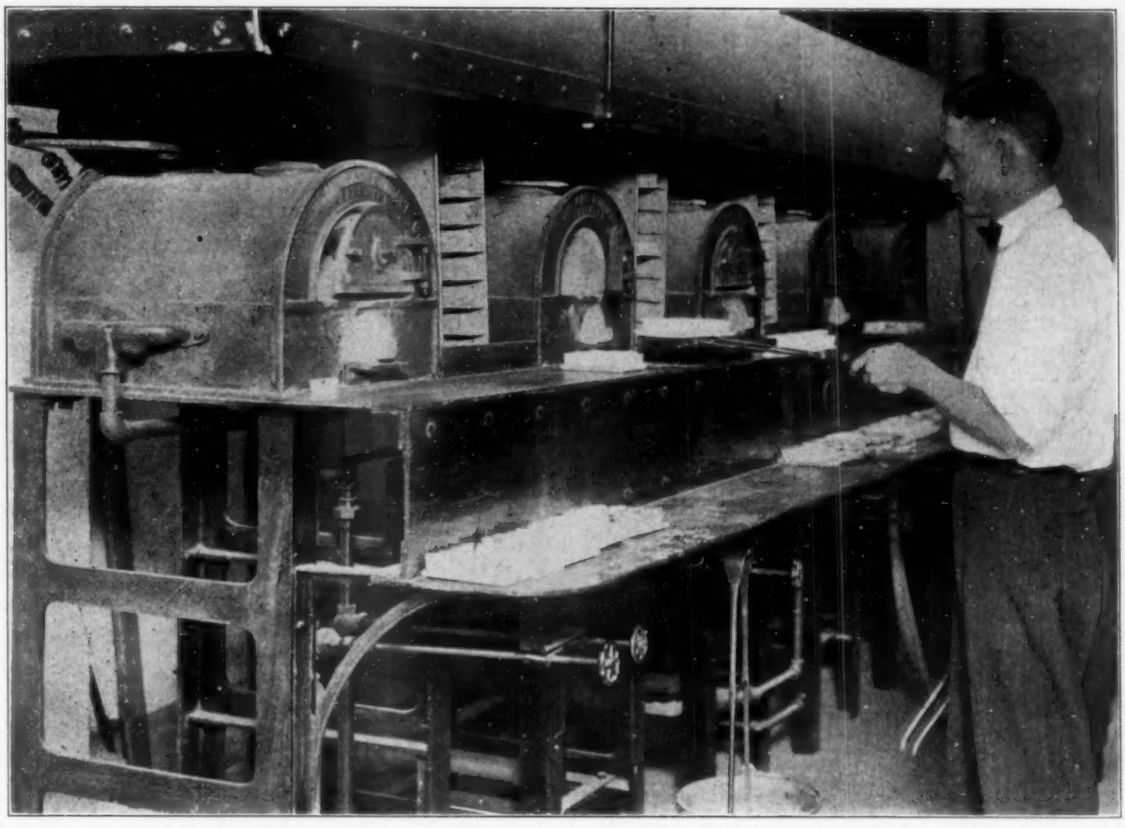

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FIG. 2. ASSAYING ROOM IN NEW YORK ASSAY OFFICE. FURNACES INSTALLED BY AMERICAN GAS FURNACE COMPANY, NEW YORK.

under way experiments in the recovery of the lead in crystal form but details are not available at this writing. The silver cathodes are now ready for disposal and are usually returned to the customer as such or are melted into bars and sold. These cathodes or bars are 999½ parts fine and all said to be suitable for silver-plating purposes.

The gold and other precious metal-bearing anodes are next taken to the gold plating or depositing room where they undergo the final refining process. This process is known as the Wohlwill process, the invention of Dr. Emil Wohlwill and was imported to this country from Germany. The same process is now being used at the new mint of the British government in Canada. In this process tanks holding upwards of twenty gallons of solutions are used. These tanks are made of Royal Berlin porcelain and are exceedingly expensive. The solution used in the process contains about one ounce of gold to the quart of solution and ten per cent. of free

of them. The metals other than gold that the anode contained go into the solution and are not deposited with the gold. Chlorides of platinum and palladium are the principal products found in the solution. These metals are afterwards recovered by a rather tedious process and then are sold to the firms dealing in such metals. The silver in the anode is of course converted to silver chloride by the hydrochloric acid in the solution and this material settles to the bottom of the tank. There is only a sufficient amount of free chlorine generated in this process to dissolve the gold, platinum, palladium, etc., so as to allow of their deposition and solution. The silver chloride remaining on the bottom of the tank is cleaned out at the close of a run, mixed with a little water and granulated zinc, and is thus converted into metallic silver and is used over again to make new anodes. If there should be found any gold in the chloride solution after the platinum, etc., have been separated, it is precipitated with ferrous sulphate in the form of a brown powder

which is metallic gold and is then added to anode material.

REFUSE RECOVERY.

Methods of recovery of the last particles of value at the assay office are very exact and painstaking. Beginning in the melting rooms, the equipment of which was furnished and installed by the W. S. Rockwell Company of New York, the flues from the melting furnaces lead into fume chambers. These chambers, situated on the lower floors, communicate with similar chambers on the top floor by means of square flues. The gases from the furnaces must pass through these chambers and flues before entering the main chimney. A great deal of valuable material is therefore recovered from these various reservoirs and the fact that the annual clean up is upwards of one thousand ounces of gold, etc., goes to show how richly such careful methods are rewarded. The refuse from the melting rooms themselves, such as dust from sweepings, old crucibles, etc., is put through a grinding process in the wet and the tailings are finally sold on a basis that nets the office returns for from ninety-two to ninety-five per cent. of the metallic contents. The clothing of the workman, washwater, etc., also goes through the same recovery process so that practically nothing in the New York Assay Office escapes examination except perhaps the air its occupants breathe. In the melting operation the office is what might be termed extravagant in its use of crucibles. A crucible for gold melts is used for three and sometimes four heats. It is then used for silver and may go to eight or ten heats, but no chances are taken that a break will occur with a pot of precious metal in the fire.

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FIG 3. THE SILVER REFINING ROOM, NEW YORK ASSAY OFFICE. TANKS INSTALLED BY THE DIDIER MARCH COMPANY, NEW YORK.

A CHEAP GUN METAL DIP FOR STEEL

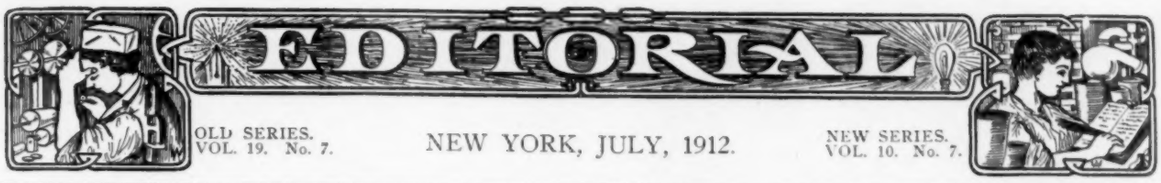
By August G. Hoffmann.

The production of the gun metal finish on steel by the use of the copperplate and potassium sulphuret solution is somewhat difficult to obtain uniformily, on large quantities, and to silverplate, which gives better results in connection with the sulphuret solution, is too expensive on many classes of work manufactured at the present time.

The following process, if used carefully and as described, will give a good black direct on steel and when lacquered it appears similar to the sulphuret black, only lacking the bluish tint. The writer has used this process extensively on steel purse frames, etc. It is obtained as follows:

Dissolve in five gallons of hot water, one pound of blue vitriol, to which add one-half pint of muriatic acid; allow to cool and term as solution No. 1. In another stone crock place four gallons of muriatic acid, to which add ten pounds of white arsenic and stir well for about fifteen minutes and add two ounces of blue vitriol—making solution No. 2.

The process is carried on by first cleaning the articles thoroughly in hot potash and cyanide dips, rinsed in clean running water and immersed in solution No. 1, where they are kept in motion until they assume a copperish tint. Then directly into solution No. 2 (which must be stirred before using) and kept in motion until they assume a deep, heavy black smut, from which they are rinsed in boiling hot water for a space of five minutes, after which they are dried in hot sawdust. On examining, it will be found that the articles are covered with a heavy black smut, which when brushed down with a hard steel brush will reveal the finish. Should a darker tone be desired it can be given a second immersion in solution No. 2. After being brushed (avoiding finger stains) the articles are lacquered.



THE METAL INDUSTRY

With Which are Incorporated
THE ALUMINUM WORLD
THE BRASS FOUNDER AND FINISHER
THE ELECTRO-PLATERS' REVIEW, COPPER AND BRASS

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ADVANCE OF ELECTRO-PLATING

To say that the growth of the National Electro-Platers' Association of the United States and Canada has been marvelous would not fall far short of the truth. A society formed in 1909 by a small number of platers and others interested in the uplift and advancement of the plating industry, has now grown until it is a powerful factor in the art of finishing metals. From the small beginning noted in the March, 1909, issue of THE METAL INDUSTRY, it has expanded until it is now a national body in fact as well as in name. The association now lists over three hundred members, active, associate and honorary, and has seven very enthusiastic branches located in the following cities: Philadelphia, Pa.; Rochester, N. Y.; Toronto, Ont., Canada; Indianapolis, Ind.; Chicago, Ill., and Cincinnati, Ohio. Interesting and live meetings are held each month (oftener by some of the branches) at which active discussions take place on all subjects relating to the complicated and fascinating art of the electro-deposition of metals.

The organizers of this association have had no easy time in placing the society on the firm footing on which it now stands. An enormous amount of painstaking labor had to be performed before the organization became a fact rather than a theory. Obstacles arose that were not thought of; personal differences had to be smoothed over; a thousand and one questions had to be answered by tact and diplomacy, but finally commonsense and the actual need for the society prevailed and then "Those who came to scoff remained to praise." Too much praise cannot be given to the founder of this association, Charles H. Proctor, and his small band of fellow-workers who believed so explicitly in the development and expansion of the craft. When Mr. Proctor at the fortieth meeting of the association retired as three times president, he turned over to his successor, Richard H. Sliter, the reins of an organization well equipped for future operations in the electro-plating field. With officers of the main body and also of the branches experts in their various lines; with two publications, a monthly bulletin and a quarterly review firmly established and handled by competent boards of editors; with the various committees composed of energetic and enthusiastic members, Mr. Sliter has at his command a most efficient machine that is capable of producing results that will be of astonishing benefit to the country at large.

One of the most important results growing out of the work of the society to date has been the breaking

down of the bars of mystery surrounding the deposition of metals. A striking proof of this is given in the letter from a prominent manufacturing firm, printed on the following page. This letter refers to the article on "Hardware Finishes," by H. E. Willmore, published in the June number of THE METAL INDUSTRY, and strongly commends the author for his progressiveness. There was a time, not so long ago, when it was the custom for firms to prohibit their employees from telling anything in print about their work, but this feeling is gradually dying out, and everyone is beginning to profit by a free and frank exchange of ideas. The feeling of need for secrecy has gradually melted away until it has been replaced by an overwhelming desire to know the "whys" and "wherefores" of the electro-plating processes. There has been a growing belief, and this has strengthened into a conviction, that a plater today, to be known as successful, must also be a chemist, sufficiently educated to at least know and understand the chemical phenomena attendant upon the plating operation. There has been previously no way for the working plater to get this necessary information in a direct and expeditious manner. Now, according to an address made at the meeting of the association held last Friday night in New York, it appears that a school for this very purpose is to be established by two members of the association. The address is published in the ASSOCIATION AND SOCIETIES column of this issue of THE METAL INDUSTRY. This is a most excellent idea and we have no doubt but that such a school will be eminently successful and that opportunities will be offered not only for the foreman plater to become more efficient and more valuable in his trade, but also that the helper may be aided in his ambition to become a foreman.

THE EIGHT HOUR LAW

An act of Congress was signed by President Taft on June 19, 1912, which limits to eight hours in any one calendar day the employment of laborers and mechanics engaged on Government work. The act which is now law is in part as follows:

"*Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled*, That every contract hereafter made to which the United States, any territory, or the District of Columbia is a party, and every such contract made for or on behalf of the United States, or any territory, or said district, which may require or involve the employment of laborers or mechanics shall contain a provision that no laborer or mechanic doing any part of the work contemplated by the contract, in the employ of the contractor or any sub-contractor contracting for any part of said work contemplated, shall be required or permitted to work more than eight hours in any one calendar day upon such work; and every such contract shall stipulate a penalty for each violation of such provision in such contract of $5 for each laborer or mechanic for every calendar day in which he shall be required or permitted to labor more than eight hours upon said work; and any officer or person designated as inspector of the work to be performed under any such contract, or to aid in enforcing the fulfillment thereof, shall, upon observation or investigation, forthwith report to the proper officer of the United States, or of any territory, or of the District of Columbia, all violations of the provisions of this act directed to be made in every such contract, together with the name of each laborer or mechanic who has been required or permitted to labor in violation of such stipulation and the day of such violation, and the amount of the penalties imposed according to the stipulation in any such contract shall be directed to be withheld for the use and benefit of the United States, the District of Columbia, or the territory contracting by the officer or person whose duty it shall be to approve the payment of the moneys due under such contract, whether the violation of the provisions of such contract is by the contractor or any sub-contractor."

It will be interesting to note how this law will work out in practice. It is certain that it will cause considerable inconvenience to concerns who ordinarily run nine to ten hours per day, when working wholly on Government contracts. To the large metal concerns, for instance, whose Government work is only a small part of their output, we do not see much trouble ahead. Such concerns that are in the habit of producing material such as ordinance and manganese bronze on Government specification for regular or casual customers can very easily adapt their work to meet the circumstances. We see nothing in the act to prevent a concern from working, say five hours on Government manganese bronze and five hours or more on manganese bronze to the same specification for a customer.

Furthermore the act says:

"SEC. 2. That nothing in this act shall apply to contracts for transportation by land or water, or for the transmission of intelligence, or for the purpose of supplies by the Government, whether manufactured to conform to particular specifications or not, or for such materials or articles as may usually be bought in open market, except armor and armor plate, whether made to conform to particular specifications or not."

In view of the above there is nothing to prevent a concern from carrying a lot of material made up to Government specifications during a ten or more hour day as stock. Stock either for the needs of possible customers or to satisfy a future successful Government bid, the fluctuations in metal prices being met as in any mill where stock is held on call.

There is no doubt but that some such scheme will be adopted by those to whom Government contracts for metal are sufficiently attractive to allow of the additional supervision necessary. We do not believe, however, that this will be true in many cases—certainly not with the larger mills. With these the probable result will be the withdrawal from the field as bidders for the contracts. The eight-hour day is still a long way off for the workers in the brass and allied trades, and although we believe it will ultimately come, it will not come through the medium of Government contracts.

CRITICISM AND COMMENT
WE CORDIALLY INVITE READERS' OPINIONS AND CRITICISMS OF ARTICLES PUBLISHED IN THE METAL INDUSTRY. SUGGESTIONS WELCOME.

THANKS!!

To the Editor of The Metal Industry:

Of late the foreman plater as well as other help employed in the plating room, seem to take an active interest in all matters where new finishes and new methods of operation are discussed. This should be gratifying to the management of all manufacturers who strive to excel by the finish and artistic touch of their product. Your June number is fully in keeping with the interest displayed in the article, "Decorative Effects on Metallic Surfaces," by H. E. Willmore. This very instructive and unselfish letter from Mr. Willmore shows a charitable disposition on his part to assist his brother plater with his knowledge of the art of plating from long experience and careful study, that would produce a finish that would be attractive and pleasing to the eye as well as useful to the modern idea. More of such letters as Mr. Willmore's will help the new man in the plating room, as well as giving the man who has spent many years in the business, new ideas, and perhaps new efforts, which will make his service more valuable, all of which will be for the general good. Publish more letters such as Mr. Willmore's and you will have many grateful friends among the platers.

Bennett-O'Connell Company,
By M. J. O'Connell,
President.

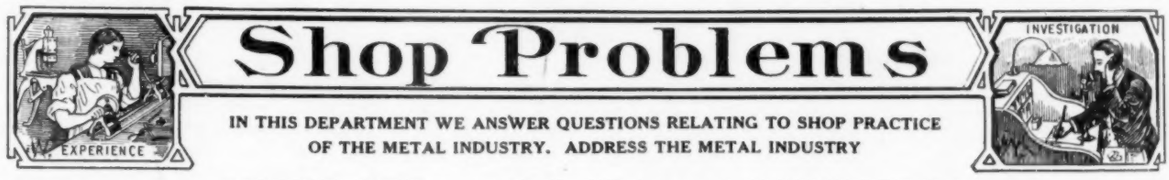
Chicago, Ill., June 21, 1912.

NEW BOOKS

THE JOURNAL OF THE INSTITUTE OF METALS. Vol. VII. Size 9 by 6 inches. 382 pages. 22 full-page plates, and a frontispiece of the president of the Institute, Professor Gowland, F. R. S., Associate R. S. M. Edited by the secretary, G. Shaw Scott, Caxton House, Westminster, S. W.

The major portion of the Journal consists of a series of papers of scientific interest which were read at the annual general meeting of the Institute, held in London in January last, and covers 248 pages. Valuable though these papers were when they were originally presented, their utility is now vastly increased as a result of written communications which have been received since the papers were read, from men eminent in the scientific and metal-working worlds. The volume under review also contains a report of the Proceedings of the Birmingham Branch of the Institute of Metals.

The useful series of abstracts of papers relating to the non-ferrous metals and the industries connected therewith, which was commenced in the second volume of the Journal, has been continued, and there are many pages devoted to valuable abstracts dealing with such subjects as The Properties of Metals and Alloys, Electro-Metallurgy, Analysis, Testing and Pyrometry, Furnace and Foundry Methods, Statistics, and Bibliography. The concluding section of the Journal is devoted to the memorandum and articles of Association; there also appears a list of members of the Institute, together with a topographical index.


EXPERIENCE
Shop Problems
IN THIS DEPARTMENT WE ANSWER QUESTIONS RELATING TO SHOP PRACTICE OF THE METAL INDUSTRY. ADDRESS THE METAL INDUSTRY
INVESTIGATION

ALLOYING

Q.—Please publish a formula for a good alloy for small brass bushings for dynamos running from 1,800 to 2,200 r. p. m. Also what is the best practice to follow in making manganese bronze?

A.—For small bushings for the purpose you name the following alloy is suitable:

Copper	79
Tin	10
Lead	10
Phosphorus	1

The alloy may be cast into sticks in metal molds, then rough-turned and finished on screw machines.

In making manganese bronze, the copper is first melted and then the manganese added. Before adding the zinc, the metal is allowed to cool down considerably to avoid loss by volatilization. The aluminum is added last of all.—J. L. J.

BUFFING

Q.—As a subscriber to your journal I would like to ask you how some buffers obtain that very high, dark and clear silver on reflectors for automobile lamps. I am nickel plating; then silver light plate and buff same without brushing, using rouge and alcohol, rouge and kerosene, lampblack and alcohol, but cannot get the real nice finish that is required.

A.—Your method appears to be satisfactory as far as the plating and finishing is concerned. The only difference between your method and that of others is that, after coloring with lampblack and kerosene, the articles should be washed and then recolored on a canton flannel wheel. This should not run at more than 800 to 1,000 r. p. m., and use instead of rouge, a little precipitated carbonate of lime, mixed with alcohol. This will give you the high clear lustre you require. The wheel should always be well combed out so that it is soft and clean when giving the final coloring.—C. H. P.

CEMENTING

Q.—Please inform me through Shop Problems how to cement or attach metal letters to glass.

A.—Use 30 parts copal varnish, 10 parts spirits of turpentine, 10 parts glue, dissolved in a little warm water, and 20 parts pulverized slaked lime. Apply this cement in a paste form on the metal letters, allow some to set and then scrape off around edges.—P. W. B.

ETCHING

Q.—Will you please give me information regarding etching with a rubber stamp?

A.—For etching steel with a rubber stamp proceed as follows: First, prepare the etching ground by dissolving resin in benzine to the consistency of a thin varnish and apply this varnish to the steel with a soft brush. Second, prepare a cotton cloth pad of a number of thicknesses of cloth so that it can be saturated with caustic potash solution (use commercial sticks), one to two ounces of water to each stick, or the solution may be made more

concentrated by using less water. Third, apply the potash solution to the stamp and impress upon the varnish resist on the steel. In about 20 or 30 seconds the varnish will eat its way through if it is not too thick. Now wash off, using a piece of soft cloth and water. Fourth, apply the acid, which should consist of nitric acid, 38 degs. Baumé, diluted with one to two parts of water and allowed to remain until the steel is sufficiently etched. Then remove the etching ground by a strong, warm solution of ordinary caustic potash or soda. It is advisable to color the etching varnish with aniline red or violet soluble in benzine, as this will make the etching ground more distinct and show up the letters better after the stamp is applied.—C. H. P.

FINISHING

Q.—Kindly give us a method to frost hardened steel knife handles to resemble sand blasting. The trouble with the acid process is that owing to the hardening process, the acid does not frost evenly.

A.—It is somewhat difficult to produce a good frosted or satin effect by mechanical methods other than sand blasting, which to us seems to be the most economical method. Any desired effect may be produced depending upon the material used for frosting sand, silex, pumice stone or ground glass. The swing scratch brush is frequently used for the purpose. This should be made from steel wire, bent into bunches and secured to wooden hubs by the aid of screw eyes of steel. The wheel is run at 1,500 r. p. m., and the satin effect is produced with a very light pressure against the revolving wire.—C. H. P.

GALVANIZING

Q.—What is the latest and most satisfactory solution for electro-galvanizing. We wish to take the articles from the vat without scratch-brushing or finishing in any way. In our present solution, the ordinary sulphate of zinc and sulphate of aluminum solution, we have difficulty in getting an even color all over the articles, the edges being a nice white color but the center is very dark. We have tried different densities and different currents, but the difficulty remains. Another difficulty is that, even with the addition of glue to our solution, which contains glycerine in proportion of one-half ounce to the gallon, the surface is quite dull, lacking lustre.

A.—Your bath evidently lacks condutivity, otherwise the deposit should be uniform. The latest practice is to add three to four ounces of chloride of zinc to each pound of sulphate of zinc used in the solution, and then increase the conductivity by adding two to four ounces of common salt to each gallon. These additions will give a good uniform white deposit. Recently the addition of common black molasses in the place of glue or glycerine, has proven very satisfactory in giving a smooth, uniform deposit.

The proportions for a bath should be as follows:

Sulphate of zinc	1½ lbs.
Chloride of zinc	4 ozs.
Common salt	2 to 4 ozs.
Water	1 gal.

C. H. P.

MECHANICAL

Q.—Which is the best method of making brass washers 1 inch in diameter, 1-32 inch thick, with ⅜-inch hole in center; also washers of the same dimensions, thickness of same 1-16 inch chamfered on each edge?

A.—If you use these in large quantities they should be manufactured with punches and dies on press. The next best method to employ is to set a pair of dividers at 1 1-16 inch diameter and mark out on the sheet brass as many squares as you want washers. Center them with punch and drill holes, then with power or hacksaw cut down the lines and cut off the sharp corners. Have a steel or brass mandrel with shoulder on one end and thread on other; for lock nut slip one hundred or less on same and turn same up to the required diameter. To chamfer off the edges of the washers place a washer of smaller diameter between each of the others to allow same to be chamfered on each edge.—P. W. B.

MELTING

Q.—We are using Morgan's clay crucibles and find that they crack when subjected to a very high heat. Then we put loam on the outside of the pots, but find that on the pot being made hot the loam splits up, the heat gets to the pot, which then cracks. Can you give us a remedy?

A.—For use in the manufacture of steel, German silver and similar metals, that require a very high temperature for melting and do not admit of contact with carbon, the crucible manufacturers are now furnishing a clay-lined graphite crucible that is very satisfactory. It is much less liable to crack than the ordinary clay crucible and does not require as careful handling.—J. L. J.

OXIDIZING

Q.—Please let me know of a good method for oxidizing platinum.

A.—To prepare a platinum solution for oxidizing, dissolve at least one-half ounce of chloride of platinum in one pint of water, then add one-half pint of grain alcohol. Apply to the cleansed surface with soft brush and dry over a Bunsen flame. The solution can be used without the alcohol, but the surface dries more quickly and more uniformly by its addition. To cheapen the cost of this solution, a solution of perchloride of iron or chloride of copper may be used, as either metal gives a good black in connection with the platinum, although the use of iron hardens somewhat the deposit. The amount of copper or iron to be added is best determined by experiment. One ounce of either to a gallon of solution will give good results.—C. H. P.

PICKLING

Q.—What is the process for taking the scale off of wrought iron and making it bright?

A.—A pickle consisting of a warm solution of hydrofluoric acid gives the best results in removing the scale from wrought iron. It should consist of from 5 to 15 parts acid and 85 to 95 parts water at a temperature of 100 degs. The pickle must be contained in wooden or lead lined tanks, as glass, stoneware or cement tanks are reaily attacked by this acid. After the scale is removed, wash well in cold water and then immerse in boiling water containing a small amount of lime. This will prevent rusting of the surface and neutralize any acid in the pores of the metal.—C. H. P.

PLATING

Q.—I would like to know if equal amounts of the different constituents of a plating bath are lost when work is taken from the tanks. In my opinion if a Trisalyt solution is used, the same amount of each chemical would have to be lost in removing the work if Trisalyts were to be used to rebuild the solution. Am I correct in this supposition?

A.—In removing articles from the bath after plating, equal amounts of material used in the plating bath are necessarily removed at the same time. Otherwise there would be a separation and it would be impossible to obtain a deposit. It is immaterial how many substances are used, as long as they combine with each other and are soluble in water a proportionate amount of each will be removed.—C. H. P.

Q.—Will you kindly publish formulas for the production of a black and a yellowish-green patina on brass and copper?

A.—To prepare a black bronze, with a yellowish-green patina in the crevices and background of the articles, copper plate the brass articles in a regular cyanide of copper bath for at least half an hour; then oxidize the surface to a deep black, by using a solution consisting of 2 ounces of sulphuret of potassium in 1 gallon of water, using the same proportions for larger quantities. After the articles have been oxidized, wash, dry and lacquer the surface; using a regular brush lacquer for the purpose. When the lacquer is dry prepare a thin pigment color, using powdered zinc white, a little dry chrome green and a minute quantity of chrome

yellow. Mix to a thin consistency with turpentine, using a few drops of turpentine copal varnish as a binder. Be careful not to use too much or your pigment will be tacky instead of opaque. Apply evenly to the lacquered surface and then dry the article with heat. After the articles again become cool, remove the green from the high grounds with soft rags, moistened with equal parts of boiled linseed oil and turpentine. After this operation is completed, wipe clean; then wax the surface, using a soft brush.—C. H. P.

Q.—I would like to have a formula for a red and a yellow brass plating solution to be used cold.

A.—The following formula for a yellow brass solution will give the best of satisfaction. The solution is run at about 70 or 80 degrees and is easily maintained in working order:

Water	1 gal.
Cyanide of potassium	5 ozs.
Dry carbonate of copper	3 "
Pulverized carbonate of zinc	½ "
Ammonia	½ "

To prepare the solution dissolve the cyanide in cold water, then add the carbonate of copper, then mix the zinc with the ammonia and add to the cyanide and copper. The solution is then ready for use. Use sheet brass anodes and as many as the anode rods will hold. If the solution plates earthy or dull dissolve 2 ounces of white arsenic in 4 ounces of caustic soda, in 1 pint of hot water and add one ounce of the mixture to a hundred gallons of solution. To maintain the solution in working order add carbonate of copper dissolved in cyanide of potassium. When the bath needs copper the deposit will show reddish on the edges, every few days add a little ammonia and if the color shows a bronze tone dissolve a little carbonate of zinc in an excess of ammonia water. By using these precautions you can obtain excellent results.

For a red brass use the following formula:

Water	1 gal.
Cyanide of potassium	5 ozs.
Carbonate of copper	3 "
Carbonate of zinc	¼ "
Bisulphate of soda	2 "

Bronze solutions are somewhat difficult to run cold, but the above formula should give you good results. When the solution plates dull add arsenic. As mentioned above avoid the use of ammonia as the color would have a brass tone. Repair the solution when necessary by adding carbonate of copper, cyanide and a small amount of zinc. Use a low brass or copper anode. Cold brass solutions when heated to 100 degs. will give an excellent red brass tone.—C. H. P.

Q.—I am silverplating steel chains and sometimes they come to me very rusty and dirty. Kindly tell me how to clean them and also how to prevent them from rusting after plating and some way to strip the silver off when bad.

A.—When the chains are rusty and dirty, first immerse them in a hot potash or soda solution, then remove and wash in cold water. Then immerse in strong muriatic acid to remove the rust; now rewash in cold water. If you wish to produce a bright surface and if you have a tumbling barrel, then put your chains in the barrel and add a solution of sal soda, using two to four ounces of the soda to each gallon of water. After tumbling for some time or until the chain becomes bright, remove, wash and then immerse in the potash, then in water and finally in a dip consisting of muriatic acid, using one part acid to eight of water. Then rewash, flash in a copper bath, rewash and nickel plate for ten to fifteen minutes; then remove and wash in water. Now immerse in the copper bath for a few seconds, wash again and immerse in a blue dip, previously prepared, consisting of:

Oxide of mercury	¼ oz.
Cyanide of potassium	4 ozs.
Water	1 gal.

As soon as the copper becomes whitish remove, wash and then silver plate in the regular manner. After silver plating to prevent rusting, the chains should be lacquered.

To remove a poor silver deposit, prepare a solution consisting of eight ounces of cyanide of potassium in each gallon of water; then connect up as a plating bath, surround your bath with sheet iron and connect to the negative or work pole. Now make the chains the positive or anode. Use a strong current and the silver will be removed very quickly, leaving the steel unaffected. When the solution becomes saturated with silver it can be used as a preliminary plating bath or the silver can be separated from the copper and nickel and the silver used for replenishing the regular bath. The chains can be burnished mechanically by using steel balls in a tumbling barrel and using a burnishing soap solution in connection with the steel balls and then tumble for fifteen minutes to half an hour.—C. H. P.

ROLLING

Q.—Is it possible to roll tubes in hot condition in the alloy 70 per cent. copper, 29 per cent. zinc and 1 per cent. tin? Do you know of a formula for a suitable mixture to this purpose containing approximately the stated composition?

A.—The most satisfactory mixture for brass tubes consists of copper 75 and zinc 25 for the reason that it brazes well. The mixture you mention is often specified for condenser tubing. It is usually hard drawn. It is advisable to use a spelter low in lead, such as Bertha or Horsehead, as the tubes are less likely to deteriorate in service.—J. L. J.

SOLDERING

Q.—Kindly give us a formula for a German silver solder with a low fusing point and free from pit holes.

A.—For soldering articles of German silver containing about 20 per cent. of nickel, the following solder is recommended:

Copper	40
Nickel	10
Zinc	50

The most satisfactory solder for this purpose, however, is regular silver solder made from 50 parts of silver and 50 parts of sheet yellow brass.—J. L. J.

SPOTTING OUT

Q.—Some time ago I copper plated some porous cast iron stair case posts. They were thoroughly rinsed, dried and lacquered, but after a few days spotted out. Can you tell me how to prevent this?

A.—The spotting out is caused by the small pin holes (due to the porosity of the metal) becoming impregnated with the solution. The humid weather in summer develops these spots more readily than is the case in winter, on account of the density of the atmosphere. To overcome this trouble, after the articles are plated, immerse in boiling water containing a little sulphuric acid, just enough to show acid to test paper. This will decompose the cyanide, leaving sulphate of potash. Repeat the operations once or twice from cold to boiling water, so that expansion and contraction of the metal can occur. This should expel all the material contained in the pores of the metal. It is sometimes advisable to immerse afterwards in boiling water, containing a little lime. This will neutralize the small amount of dilute acid that might remain and should overcome any difficulty of spotting out.—C. H. P.

THREADING

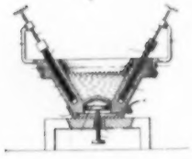
Q.—Will you kindly inform me what is the best kind of a thread to use on compression bibb and also steam globe valves, the acme standard or square thread?

A.—The acme standard thread is an adaptation of the most commonly used style of worm thread and is intended to take the place of the square thread. It is a little shallower than the worm thread, but the same depth as the square thread and much stronger than the latter. I advise its use in place of the square thread in all cases where it is desired to produce that style of a thread on a screw-machine or turret lathe as it overcomes to a large extent the difficulties hitherto found in cutting square threads with a die. It is also an excellent form of thread for compression bibb stems or valve spindles.—P. W. B.

PATENTS

REVIEW OF CURRENT PATENTS OF INTEREST TO THE READERS OF THE METAL INDUSTRY.

1,026,281. May 14, 1912. Electric Refining Crucible. James Henry Reid, of Newark, New Jersey, assignor, by mesne assignments, to the Patents Purchasing Company, of Appleton, Wisconsin, a corporation of Wisconsin.



The invention relates to improvements in electric refining crucibles, as shown in cut, and the objects of the invention are to facilitate the initial heating of the crucible and avoid the necessity of using an excessive amount of current to effect the heating and it consists essentially of current conducting elements operative in recesses in the wall of the crucible.

The patent contains the following claim:

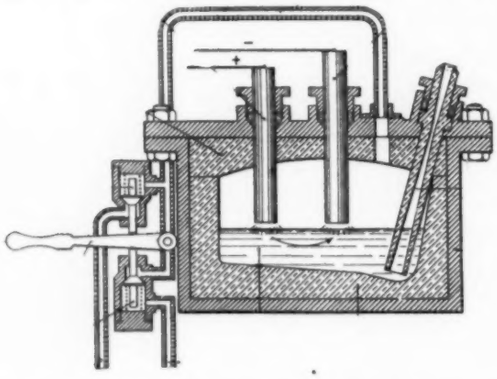
An electric refining crucible having a recessed current-conducting wall, a current-conducting element movable therein and means for moving the current-conducting element inwardly and outwardly.

1,026,733. May 21, 1912 Process for Casting Metals. Franz De Buigne, Magdeburg, Germany.

This invention relates to a process for casting metals under pressure, as shown in cut, that is, particularly difficult fusible metals such as bronze, aluminum or the like.

The invention consists in melting the metal by internal heating in a container, or maintaining the metal molten by internal heating in the container, during the casting operation.

Hitherto the casting metals under pressure has generally been effected through external heating. In the event of metals to be

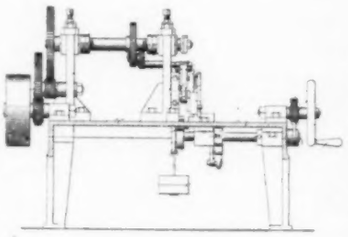


cast being of high melting point and when high pressures are used external heating has its disadvantage, is difficult or impossible to keep the walls of the furnace or crucible sufficiently resistant at these high temperatures. According to this invention the heating is from within and in consequence it is possible to keep the outside of the crucible or furnace by choice of suitable constructional material and suitable thickness of wall and if necessary by cooling devices, sufficiently cool to insure the desired degree of resistance to mechanical pressure or gas pressure, such as is unavoidable in the process of casting under pressure, without disturbing the melting operation.

The contents of the crucible may be heated in various ways; for example by introducing a flame of gas under pressure. In many cases it is advantageous to use electrical heating.

1,026,983. May 21, 1912. Machine for Rolling Finger Rings. Henry Henrich, New York, N. Y.

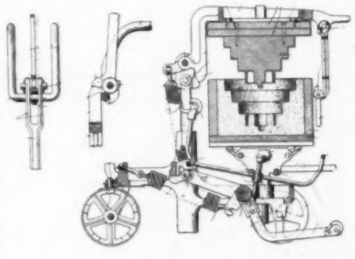
This invention relates to an improved machine for rolling seamless finger rings in which the blanks, which are formed by means of dies, are transformed into a completely finished ring of the required size and cross-section, the size to be produced being accurately controlled by a visual index so as to permit the removal of the finished ring at the proper time.



The advantages of the improved construction of the machine for rolling finger rings, as shown in cut, are, first, that the operating parts are accessible from the front end of the machine so as to permit the convenient insertion of the blanks and removal of the finished rings; second, that the mandrel can be readily removed from and replaced in the spindle so as to facilitate and expedite the insertion of the blanks and removal of the finger rings; third, that the operating parts are readily raised toward the grooved ring-forming roller and lowered again after the finger ring has been rolled into proper shape, which is due to the counterbalancing of the weights of the slide-piece and slide-plate; fourth, that the mandrel being supported at both ends by two pairs of rollers, gives a solid support to the blank and performs the rolling operation in connection with the ring-forming roller and the guide-rollers in a positive and reliable manner; and, lastly, that by the size-indicating scale and finger the rolling of the blank into the required size of ring can be readily observed and the motion of the rolling parts immediately interrupted as soon as the index or pointer arrives at the number corresponding with the desired size of ring to be rolled.

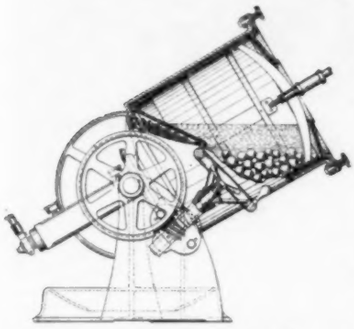
1,027,066. May 21, 1912. Molding Machine. E. A. Pridmore, La Grange, Ill.

This invention relates to the type of molding machines comprising, generally stated, a marginally-hinged pattern and flask carrier adapted, when in one position, to support the pattern and flask in inverted position to permit the molding sand to be rammed into the latter for making the mold, and be movable from such position to deliver the flask in upright condition to a support, and means for separating the pattern from the mold; and the objects, generally stated, are to provide improved means in a machine of the type shown in cut, for receiving the flask from the hinged carrier and supporting it in righted condition, to the end of adapting the machine for use with flasks of varying heights; to provide for the withdrawing of the pattern in a manner which will prevent impairment of the mold; to provide means for releasably clamping the flask and bottom board to the pattern-carrier which shall be operable for permitting the withdrawal of the pattern from the mold by lifting the pattern, and which may be readily and repeatedly operated without danger of accidental release or exertion of unequalized forces against the mold and consequent damage to the latter, involving loss of time and expense; and, generally, to improve upon the details of machines of this type as hitherto constructed, to the end of rendering them better adapted for performing the functions intended.



1,028,786. June 4, 1912. Electro-Plating Apparatus. M. Reid, Cleveland, Ohio.

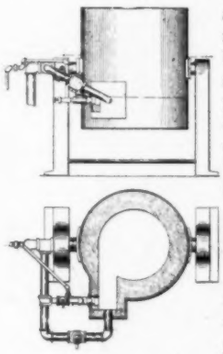
This invention relates to electro-plating apparatus, and more particularly to an apparatus of this kind wherein the articles to be plated are subjected to a tumbling action during the plating operation.



The invention has for its general objects to improve the construction and operation of apparatus of this character; to provide an apparatus, as shown in cut, wherein the electro-plating operation may proceed with great rapidity and economy; to improve and simplify the construction of apparatus of this kind while lessening the cost of production of the same.

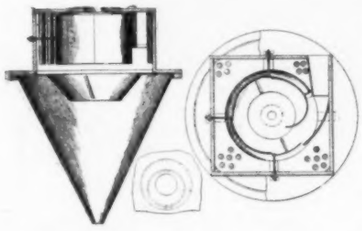
1,029,090. June 11, 1912. CRUCIBLE FURNACE. D. R. Steele, Curtis Bay, Md. Assignor to H. D. Harvey, Baltimore, Md.

An improvement in melting furnaces employing a crucible and covered by the following claim: The combination with suitable bearings of a crucible furnace, as shown in cut, having trunnions mounted in said bearings, said furnace having a furnace chamber and having a combustion chamber comprising a passageway leading into the lower part of the furnace chamber, a burner arranged to direct its burning gases into the combustion chamber transversely of the passageway, a main air pipe having one end swiveled at the pivotal axis of the furnace and having its other end connected with the furnace chamber, said pipe arranged to deliver a blast of air longitudinally of the passageway against the gases and into the furnace chamber, a branch air pipe leading from the main pipe between said ends and connecting the main pipe with the burner, a valve in the main pipe between the branch pipe and the combustion chamber, and a fuel pipe leading to the burner.



1,029,214. June 11, 1912. DUST-COLLECTOR. Orville M. Morse, Jackson, Mich. Sarah G. Morse, special administratrix of said O. M. Morse, deceased.

This invention relates to centrifugal dust collectors, and has for its general object to provide a machine of the character specified, wherein the leakage of dust from the air outlet is reduced to a very small quantity, and the back pressure at the same time minimized. To these ends there is provided in general a machine, as shown in cut, wherein air is introduced at the upper part of the structure into an area of eccentric plan configuration, relative to the casing axis, wherein it may establish a vortical whirl, and by the encompassing walls whereof the air is directed into operative proximity to an air outlet opening to escape therethrough, there being provided without the eccentric whirl area, and communicating with the periphery of said whirl area, an air-flow space wherein air flows in a rotary direction concentric with the casing axis.



1,028,216. June 4, 1912. MELTING AND CASTING MAGNESIUM AND ALLOYS THEREOF. B. Hoffmann and R. Suchy, Graesheim, Germany. Assignors to Chemische Fabrik Griesheim Elektron, Frankfort-on-the-Main, Germany.

The process that this patent covers consists in adding calcium to magnesium when melted, in order to prevent the formation of oxides and nitrides. The invention is best carried out as follows:

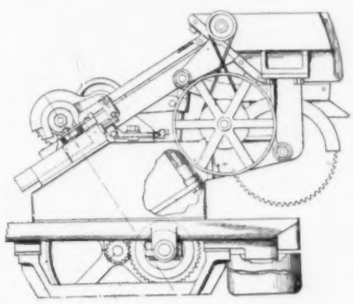
Example 1: Into a suitable crucible 10 kilograms of magnesium and 50 grams of calcium are introduced and the crucible is covered with a lid and heated to 700 degs. centigrade. After energetic stirring, the melt is ready for casting.

Example 2: 10 kilograms of magnesium and 70 grams of powdered burnt lime are introduced into the crucible and the operation is further conducted as in Example 1.

It will be appreciated that the amount of calcium employed is so small that it cannot impart to the metal the characteristics of a calcium alloy. In fact, the calcium so nearly disappears during the operation that the cast metal contains only a trace thereof, no more pronounced than the traces of other metals commonly existing in magnesium as innocuous impurities.

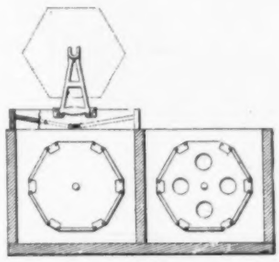
1,029,653. June 18, 1912. SLOTTING-MACHINE. Richard Lester Wilcox, Waterbury, Conn. Assignor to The Waterbury Farrel Foundry & Machine Company, of Waterbury, Conn., a corporation of Connecticut.

This invention relates to new and useful improvements in slotting machines, and has for its object, among other things, to provide a machine, as shown in cut, wherein the heads of screws, rivets, nipples or similar articles, may be automatically slotted, and in the operation of the machine to convey the said articles by yielding mechanism, that will stop if the parts become disarranged or clogged, to the point where the saw performs its operation; to lock the holding mechanism against movement during the sawing operation; to mount the saw mechanism so that it may be conveniently adjusted for cutting slots of varying depths and moved out of its operating position when desired; means for automatically separating the chips from the articles operated on; and means whereby a supply of clean oil will be delivered to the saw and returned after the sawing operation to the source of supply, free and clear of chips or other foreign matter.



1,030,053. June 18, 1912. PLATING MACHINE. Seth C. Catlin, Bloomfield, N. J.

This patent covers a plating machine in which a basket is provided with panels which are preferably made of fabric which are adapted to be slid longitudinally from or into the basket to provide the sides of the basket, this construction providing for a quick assembling or separation of the basket, providing for an easily cleaned basket, and provides sides for the basket, which sides are easily penetrated by the liquid in the tank.



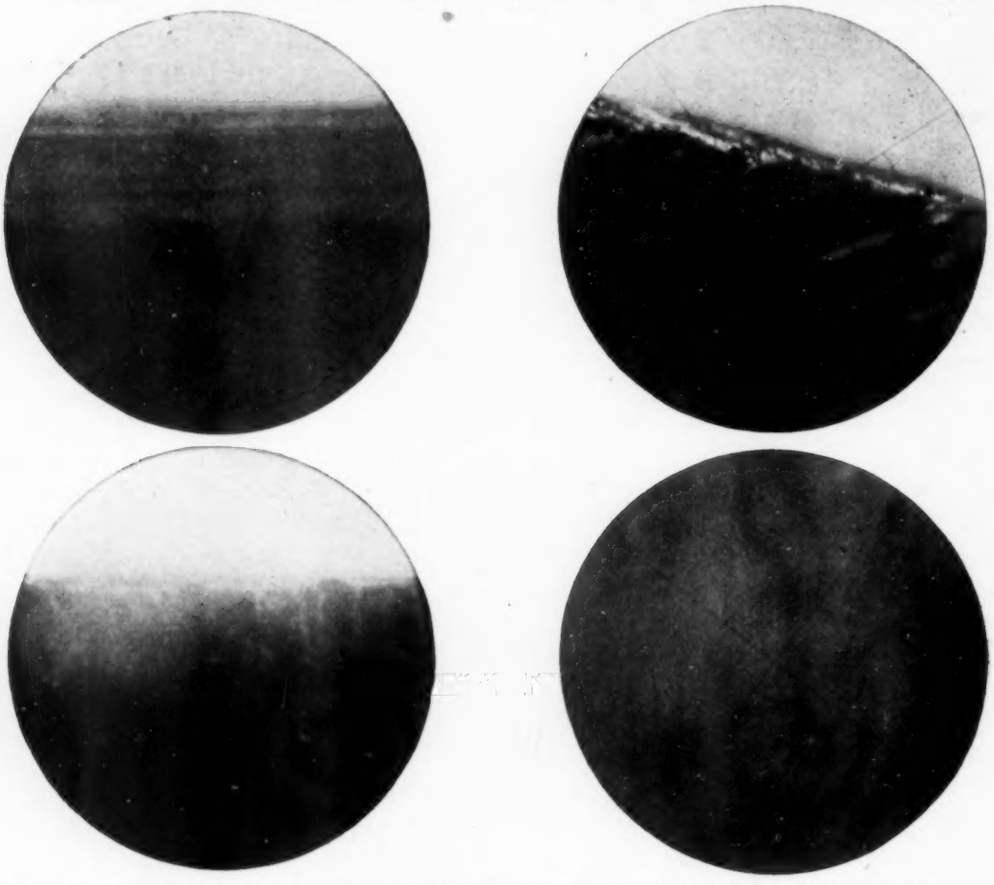
Another object of the invention is the provision of a plating machine which is provided with a drain-tray which is removably placed on the top of the tank, the tray having a bottom provided with a strainer so that when small articles are being plated, the basket can be placed on bearings with which the drain-tray is provided, can be drained, and if it is desired to facilitate matters it can be dumped on the drain-tray and the material allowed to drain therefrom, and the basket in the meantime replaced in the tank to receive another quantity of material for plating.

INDUSTRIAL

NEW AND USEFUL DEVICES, MACHINERY AND SUPPLIES OF INTEREST TO THE READERS OF THE METAL INDUSTRY.

LOHMANN GALVANIZING PROCESS

This is a new process for the coating of iron or steel with zinc or lead. The process has been covered by patents of Herman J. Lohmann, which are owned by the Lohmann Company, 50 Church street, New York, who issue licenses under which the process may be worked. Among the concerns at present using this process are The Brier Hill Steel Company, Youngstown, Ohio, from whom we obtained most of the data here given, including the photographs; The Forest Sheet and Tin Plate Company, Niles, Ohio, and the Erie Railroad.



MICROPHOTOGRAPHS TO EXHIBIT THE FEATURES OF THE LOHMANNIZING PROCESS APPLIED TO IRON AND STEEL SHEETS.

The upper left photograph is one of the edge of galvanized sheet, showing the somewhat sharp line of demarkation between zinc layer and metal of sheet. Reduced from photograph magnifying 65 times so that it now appears about 45 times magnified.

The lower left photograph shows the effect of the Lohmann process. The deep penetration of the protective alloy is indicated by what may be called long, slender tentacles, differentiating the result from that showing a layer rather than an amalgamation. Reduced to about 45 diameters from a photograph magnified 65 times.

The upper right photograph shows the edge of a lead Lohmannized corrugated iron sheet, magnified 65 times with same subsequent reduction as before. The permeation of the sheet by the alloy is indicated.

The lower right photograph shows the surface of Lohmannized corrugated metal, at about 21 magnifications, the original photograph being magnified 30 times, and is reproduced to show absence of pinholes.

The Lohmann process follows very closely the old hot galvanizing method; in fact, the only difference is in the use of the "Lohmann bath." This bath contains an acid and an amalgamated salt, and what the patent covers is the solution of hydrochloric acid, bichloride of mercury and salammoniac. In brief the process is as follows:

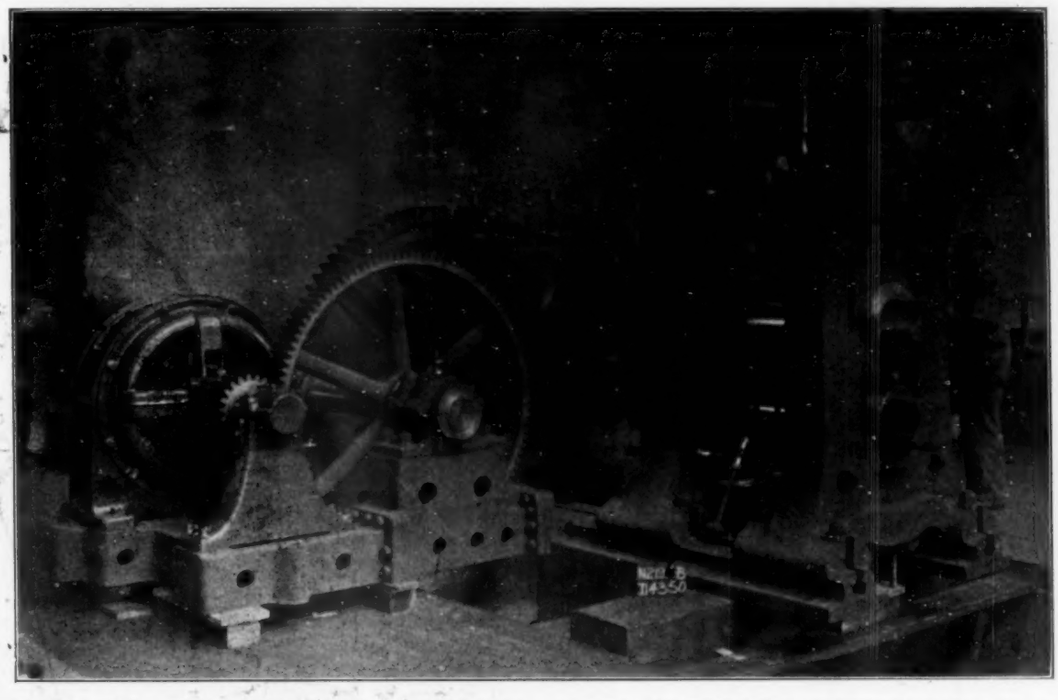
The metal to be treated is pickled in a bath of sulphuric acid to remove rust and scale, and it is then dipped in the bath, where the pores and cavities of the metal are further cleaned. A metallic salt is deposited upon the entire surface, penetrating the cavities, as explained, and then the treated metal is dried and immersed in a molten alloy, where an amalgam is formed. The metal is gradually raised in temperature by the molten alloy, which has a temperature of 950 to 1000 degs. F. When the specimen treated reaches a temperature of 500 degs. the amalgamated element volatilizes, and on being released comes to and passes rapidly from the surface of the alloy. The point is here made that in its passage this evaporating amalgamated salt frees the surface of the metal, including pores and cavities, from all oxidizing agents. As the salt in evaporating empties itself from each microscopic pore the protective alloy takes its place and the base surface being cleaned it adheres. The oxygen present in the pores and on the surface, it is added, having a greater affinity for the amalgamating element than for either the base metal or the alloy, passes to the atmosphere, leaving no form of oxygen lying between the treated metal and the protective coating. The truth of the statements made above is evidenced by a perusal of the micro-photographs given above.

SHEET METAL ROLLING MILL

The mill shown in the cut was designed for finishing sheet metal in cases where the reduction desired is rather less than the extreme reduction possible with the metal. It is equipped with simultaneous adjustment for both ends of the rolls, has finishing guides and steel tip receiving table, and is motor driven. The machine is double-geared to the motor, and has cut gears. In cases where the mill must be used to its capacity it would be possible to put in a larger motor and heavier gearing and accomplish the results satisfactorily. The simultaneous adjustment is so designed that a micrometer gauge is embodied in it. The design of the pinion housings is such that the pinions are enclosed, thus making it possible to run them entirely in oil.

Machines of this same general type are made in this 16-inch diameter roll size, and also in 14-inch and 12-inch sizes. The machine shown weighs about 27 tons, the rolls turn 17 r. p. m., and the machine is geared about 30 to 1. It occupies a space of about 12½ square inches on the floor. Special attention in designing was paid to dowelling all joints so that the exact location of the motor pedestal, pillow blocks, etc., on the base plates is assured on erecting in the field, and has proved satisfactory in service.

The mill was recently installed at the plant of Reed & Barton, silversmiths, Taunton, Mass., by the Waterbury Farrel Foundry & Machine Company, Waterbury, Conn.



SHEET METAL ROLLING MILL INSTALLED FOR REED & BARTON, SILVERSMITHS, TAUNTON, MASS., BY THE WATERBURY FARREL FOUNDRY AND MACHINE COMPANY, WATERBURY, CONN.

OAKITE

Oakite, a novel compound now being manufactured by the Oakley Chemical Company, 22 Thames street, New York, has a universal application and is meeting with remarkable success according to the reports received by the manufacturers. Oakite has four main uses in metal working shops for which the following claims are made:

1. OAKITE CUTTING AND GRINDING COMPOUND is an emulsion of Oakite in solution in water with a small amount of soluble cutting oil. Oakite solution divides up the oil into fine particles which remain separately suspended and carries to the work uniform proportions of oil and Oakite, for lubrication and cooling respectively. This compound gives smooth quick cutting, true to gauge through avoiding expansion by heat. Machines are clean and free from gummy oil and fine chips. Product bright and clean. Oakite is harmless therefore operator is in no danger of infection in cuts or sores. Oakite is the best and cheapest cutting compound for milling, planing, shaping, drilling, boring, reaming, tapping, screw or thread cutting, thread rolling, pipe threading, sawing, grinding, polishing, stamping, drawing, etc. Oakite saves 80 to 90 per cent. of the cost as compared with cutting oils and accomplishes 30 per cent. more work.

2. OAKITE FOR REPLACING THE ALKALIES (straight or mixed) in the cleaning of metal products for plating japanning, lacquering, etc. Oakite cleans better, quicker, with less labor, at less cost than caustics, sodas, etc. Saves "tumbling" with sawdust for drying. One ounce Oakite to one gallon of hot water removes all grease, dirt, etc., from iron, brass, copper, aluminum, nickel, silver, etc. It makes no suds, so no greasy, soapy film to be removed. Does not burn hands, clothing or material. No fumes, no odors.

3. OAKITE FOR CLEANING WASTE AND WIPING CLOTHS AND SAVING OIL FOR RE-USE. All recovered with Oakite for repeated re-use—the waste (or cloths) may be cleaned 150 times or more. The recovered oil is unchanged, chemically or physically, by Oakite. No machinery to purchase. Use a barrel or tank. Unskilled labor. The cost is trifling. The saving is great.

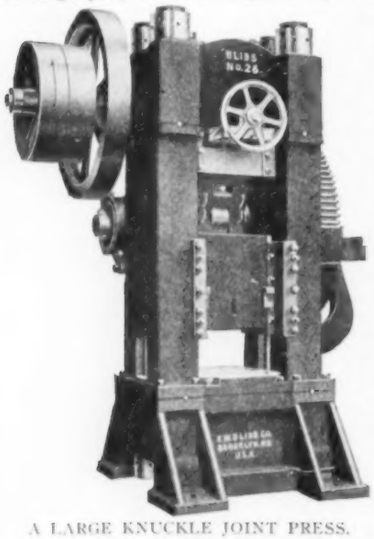
4. OAKITE FOR GENERAL CLEANING IN FACTORIES for floors, walls, apparatus, etc. Thorough cleaning at less cost and without injury.

The Oakley Chemical Company guarantees that Oakite, when used as directed, will do all that they claim therefor. In any case that it does not, the exact facts are to be promptly reported to the Oakley Chemical Company, and they will advise how to overcome same, or where practicable will send a representative; and if Oakite then will not accomplish what the Oakley Chemical Company guarantees, the goods may be returned by purchaser within 30 days of date of invoice. But if they are not so returned by then (except when held longer at the request of the Oakley Chemical Company), then the goods are to be paid for.

Under the above guarantee, upon request, a sufficient quantity of Oakite for thirty days' free trial will be sent.

A LARGE KNUCKLE JOINT PRESS

During the last few years there has been in press building a continually increasing movement towards the building of presses of large proportions and great capacities as well as presses of new designed. This is accounted for by the fact that it is every day being demonstrated in some of the many manufacturing establishments that with the power press many articles can be made more economically and more uniformly than with the older methods employed. One of a new line of Knuckle Joint Presses recently brought out by the E. W. Bliss Company, of Brooklyn, N. Y., is shown in the accompanying illustration. They are specially adapted for heavy stamping and embossing operations on steel, brass, copper, silver, brittania, etc., being particularly adapted for embossing operations in the manufacture of metals, coins, regalia, jewelry, watches, etc.



A LARGE KNUCKLE JOINT PRESS.

The Knuckle Joint principle which is used gives with the minimum amount of friction and power a most powerful movement to the slide at the end of the stroke when the work is being done, in addition providing a slow movement at this point, which is desirable when it is required to have the metal flow while under pressure, as is the case in embossing. The machine is constructed along different lines and much larger than any heretofore attempted in this class, being capable of exerting a pressure of 800 tons. As will be seen, the bed is stationary and the toggle links are placed above the slide in the same position as pitmans in an ordinary crank press and operated by a crank shaft in the rear of the press. This construction not alone allows of giving a longer stroke to the slide, but also permits of the use of positive knockout attachments in the bed and cross-bar knockouts in the slide, a feature which will be appreciated by practical press men.

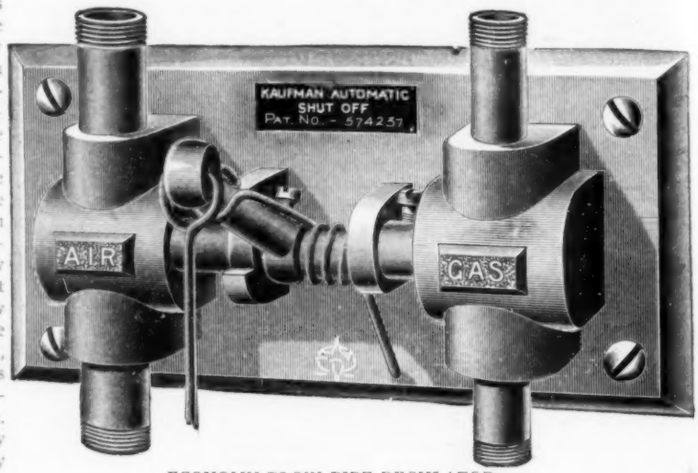
The machine is of what is known as tie-rod construction; the bed and crown piece each being separate castings. The side housings which take any side strain and provide bearing surfaces for the side and crank shaft are also separate and of box section. Through them pass the four large vertical tie-rods which bind the machine together and take the entire strain when the press is doing its work. This method of construction not only acts as a guarantee against breaking the frame, as would be possible with a solid frame, but also provides a means for releasing the press should it become stalled on its center, as the tie-rods may be heated and expanded through suitable openings provided, thereby releasing the press.

Some of the dimensions of the press shown that may be of interest are:

Distance between uprights	28 inches.
Stroke of slide	2 "
Area of slide flange, F. B. X. R. L.	16 ins. x 22 "
Area of top of bed, F. B. X. R. L.	27 ins. x 34 "
Total weight of machine	45,000 pounds.

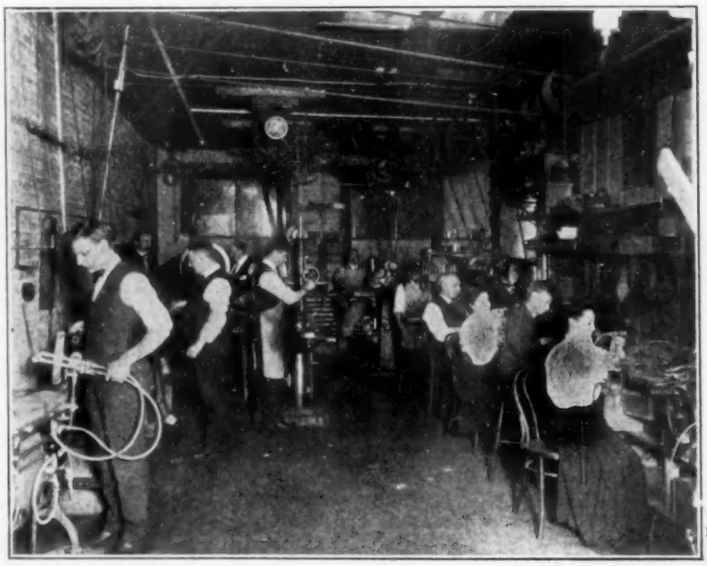
IMPROVED KICK VALVE

The Kaufman improved automatic shut-off or kick valve is shown in the cuts, and is used for gas brazing, soldering, tempering and annealing operations, where it is claimed it effects a saving of from 25 to 50 per cent. in gas. The valve is an attachment for automatically regulating by means of the foot both air and gas at the same time; or it can be adjusted to shut off the air entirely and allow just enough gas to escape to keep a pilot flame going. It shuts off the gas when not actually required at the moment the workman removes his foot from the treadle, and the gas is automatically reduced to a pilot flame just sufficient to save trouble of relighting. The flame is regulated in size depending upon the pressure of the foot.



ECONOMY BLOW PIPE REGULATOR.

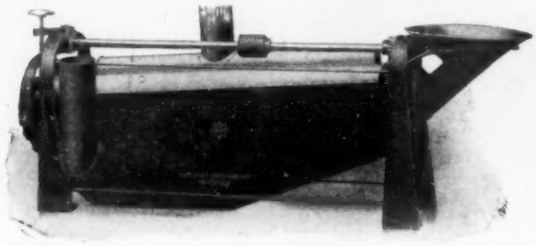
The gas and air valves are connected to a common rock shaft, to which is connected a treadle cord or wire. The valves communicate respectively with air and gas service pipes. The valves are so regulated in their respective positions as to cause a definite proportion of air and gas to be commingled, and both being secured to the rock shaft are moved thereby in positive unison. A spring is disposed about the rock shaft whose action is to normally turn the valves to a closed position, and it is only when the treadle is depressed that the flow is maintained. In order, however, to maintain a small flame for quick service, without the necessity of striking a match each time, the gas valve is set so as to permit a very slight flow, keeping a small pilot flame going. The valve is manufactured by the A. G. Kaufman Manufacturing Company, 83 Reade street, New York, who will send catalog on request.



SHOWING KICK VALVE IN USE ON BRAZING AND SOLDERING TABLES.

NEW DRYING-OUT MACHINE

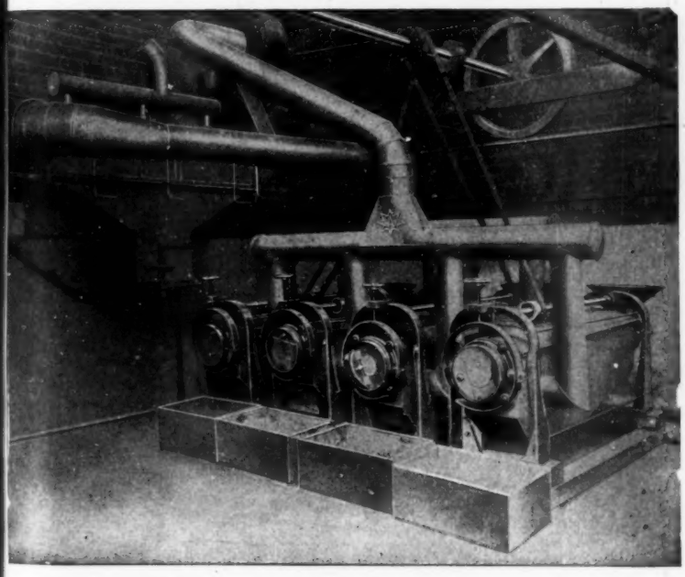
The drying-out machine shown in the cut, Fig. 1, is manufactured by Alldays & Onions, Birmingham, Eng., and is fully protected by patents. The drying-out machine consists of a circular perforated drum, which slowly revolves, and through which the work is automatically passed. Hot air is used, as the drying medium, and it enters the machine at the top, passing through and out at the bottom of the drum, leaving the machine at the side through a pipe seen on the cut, Fig. 2, which shows a battery of four patent drying-out machines side by side. The difficulty experienced with some other drying machines, owing to the articles' "nesting" together, has been quite overcome, as this "nesting" is quite impossible with Alldays' drying-out machine as the articles are gently dropped



ALLDAYS' PATENT DRYING-OUT MACHINE.

in the drum (without the slightest fear of damage to the most fragile) at frequent intervals, the result being complete separation, one from another.

The warm air is supplied from a heater, the heat being obtained from steam, gas, coal, coke or waste fuel from muffles or boilers. The cut, Fig. 3, shows one type of gas heater made specially for use with these patent machines, and also the fan which supplies the air necessary for drying. This fan passes the air through the heater, from thence to the machine or machines, and then exhausts back again to the heater; sufficient



PHOTOGRAPH OF A FOUR-MACHINE BATTERY OF ALLDAYS' PATENT DRYING-OUT MACHINES.

leakage takes place to prevent even partial saturation of the air. After being dipped in the usual manner, finishing in warm or cold water, the articles are thrown from the basket into the hopper at the entrance end of the machine. Then within one to three minutes they are automatically discharged from the other end absolutely dry and with perfect finish, into a receptacle ready for taking away when the full batch is finished. With many articles it is as well to drop sawdust with them into the hopper from a box above, as this assures a uniform, excellent finish, but the sawdust is separated and drops through the perforations into the bottom of the surrounding box of the machine. Being bone dry, it may be taken away from the box and used again and again, the cost being infinitesimal.

When it is clearly understood that one man only is required for both dipping and "drying-out," the enormous labor saving possibilities may easily be believed. The one man does the dipping and drops the articles straight from the basket into the machine, and then goes on with his dipping. He has finished with these articles until the total quantity, whether it be a gross or ten thousand gross, be completed. This machine is being use for all classes of stamped brass goods, such as eyelets, curtain rings, cartridge cases, brass heads for nails, paper fasteners, curtain hooks and fittings, incandescent fittings, etc, etc. All are satisfactorily dealt with, and the saving is in several cases being found to be sufficient to cover the cost of the plant in the first twelve months, apart from the convenience and saving of time which also accrues. Further particulars may be had from Messrs. Alldays & Onions, Birmingham, England.

IMPROVED GALVANIZING PROCESS

The Grasselli Chemical Company, 80 Maiden Lane, New York, have devised some improvements in the hot galvanizing process which are claimed to give excellent results. Briefly the process is as follows:

Articles to be galvanized are generally first put into the sulphuric acid pickle and allowed to remain until it is decided that they have been thoroughly clean. This pickle is usually a hot solution of acid and water, so as to cause quick action. From this vat the articles are rinsed in water, and then in some cases are stored for a while in a muriatic pickle. This is in order to remove any oxide that may have accumulated after the articles come from the sulphuric pickle or any spots that were not obliterated by the first acid. From here the articles are again rinsed in water, and then usually are placed in the drying oven to dry them thoroughly and bring up the temperature so they will reach the spelter bath at as high a temperature as possible. It will be readily seen that by drying these articles they will re-oxidize somewhat, and this will cause a loss of metal on account of forming dross, as well as preventing the free running of the metal on the article.

Now the new suggestion is to put a solution containing a base of chloride of zinc into a tank after the last rinsing water. This solution is a slow-drying one, and will allow the articles to go from there into the drying oven, where they will become warmed up, but not thoroughly dry. The solution will adher to them as warm moisture, but they will be of such a temperature that it will prevent splashing. In this way the articles have no opportunity to re-oxidize; consequently, the metal is saved that would formerly go into dross on this account, and the articles are thoroughly fluxed, which allows the metal to flow freely, insuring a much better coating with a minimum consumption of metal. It also is the means of a slight saving in salammoniac, as the articles, having already been fluxed, do not require so much action by the salammoniac, although the salammoniac is still used on the top of the kettles to prevent the oxidation of the spelter. In some plants it has been found possible to do away with both the last muriatic pickle and the last rinsing water, and use only three tanks; namely, the sulphuric acid, the rinsing water and Grasselli Galvanizing Flux, but this is not recommended for all plants, as conditions are different, according to the articles handled.

ROJAS ELECTRO-CHEMICAL DEPOSITION PROCESS

The Rojas Electro-Chemical Company, 516 West 25th street, New York, announce the perfection of their gold solutions for use in the Rojas electro-deposition method of producing gold finishes, which they have installed in a number of factories. This process is revolutionary, giving results in a few minutes that cannot be equaled by older methods in hours.

Associations and Societies

DIRECTORY OF AND REPORTS OF THE PROCEEDINGS OF THE METAL TRADES ORGANIZATIONS.

AMERICAN INSTITUTE OF METALS

President, L. W. Olson, Mansfield, Ohio; Secretary and Treasurer, W. M. Corse. All correspondence should be addressed to the Secretary, W. M. Corse, 106 Morris avenue, Buffalo, N. Y. The objects of the Association are for the educational welfare of the metal industry. Annual convention with the American Foundrymen's Association in a succession of cities as invited. The next convention will be held at Buffalo, N. Y., September 23-27, 1912.

The Bulletin of this association for June contains an appeal to the members for their co-operation with the committee appointed by the Institute and the United States Bureau of Mines, in an investigation of the efficiency of brass melting furnaces. The list of twenty-seven questions to be answered by those disposed to give information regarding their working is contained in the Bulletin and copies of the same may be obtained from Secretary Corse. H. W. Gillette, 84 Euclid avenue, E., Detroit, Mich., is chairman of the committee, and he will receive the replies to the questions.

The secretary reports the following new members: Erie Specialty Company, Erie, Pa.; Otto Gerline, Three Rivers Brass Works, Three Rivers, Mich.; American Manganese Bronze Company, New York; Dr. John F. Thompson, Monel Metal Manufacturing Company, Bayonne, N. J.; George Petinot, Titanium Alloy Manufacturing Company, Niagara Falls, N. Y.; Walter Arthur, General Electric Company, Schenectady, N. Y.

NATIONAL ASSOCIATION OF BRASS MANUFACTURERS

President, Theo. Ahrens, Louisville, Ky. All correspondence should be addressed to the Commissioner, William M. Webster, 1813 City Hall Square Building, Chicago, Ill. The objects of the Association are to promote in all lawful ways the interests of firms engaged in the manufacture of brass goods. Meets every three months. Each meeting fixes the place and date of the meeting to follow, consequently there is no stated place. It has been customary for the Association to hold its Annual Meeting in New York City in December of each year.

Commissioner Webster reports that this association held one of the most successful meetings it has held for a number of years at the Ponchartrain Hotel, Detroit, Mich., on Tuesday and Wednesday, June 11 and 12, both from points of attendance and accomplishments.

It elected some new members, adopted a uniform standard of basin cock shanks of 2¼ inches and discussed the new eight-hour law passed by the United States government and the labor situation in general. The association reaffirmed its past position in reference to stamping goods, and then adjourned to meet in Toronto, Canada, on September 10 and 11.

NATIONAL BUREAU OF SPRING BED MANUFACTURERS

President, Hy. H. Marousson, Chicago, Ill. Commissioner, M. Wulpi, 661 Monadnock Building, Chicago. Ill.

The third annual meeting of this association was held at Old Point Comfort, Va., June 5, 6 and 7, with twenty-six manufacturers present. Commissioner Wulpi's report showed that the membership had kept up, enthusiasm was growing, and that considerable progress had been made towards the standardization of the various parts of a bed. A number of stirring addresses were made, and the whole conference was conspicuous for the spirit and unity that prevailed.

ELECTRO-PLATERS' ASSOCIATION

President, Richard H. Sliter, Jersey City, N. J.; Recording Secretary, A. J. Stremel, Brooklyn, N. Y. All correspondence should be addressed to the Secretary-Treasurer, Royal F. Clark, 246 Fulton avenue, Jersey City, N. J. This is an educational society, the objects of which are to promote the dissemination of knowledge concerning the art of electro-deposition of metals in all its branches. Meets at Grand Opera House Building, 309 W. 23d street, on the fourth Friday of each month, 8 p. m.

The regular monthly meeting of this association was held on June 28, at which routine business was transacted.

At the meeting of the Philadelphia branch, held at Dooner's Hotel, June 28, one application for membership was received and the discussion on Nickel Solutions was continued.

The Toronto branch held a very interesting meeting on June 1, at which L. P. Sturdevant, of the Celluloid Zapon Lacquer Company of New York, read a very instructive paper on Lacquers and Their Uses.

An interesting address was given by Herman H. Reama, former treasurer of the association. This address, which is published in full below contained the announcement of the establishing of a school for platers where the chemistry of electro-deposition will be taught, and also electro-plating on a scientific basis. Further information regarding the school and its object will be given in an early issue of THE METAL INDUSTRY.

Many evenings have been passed pleasantly in this hall listening to many men giving their versions on different subjects, some on theories and some on actual experience, and they have tried to aid others whenever trouble arises, or advise them on some new finish which was best, or what to use, etc. The present generation is most critical, no doubt you can recall the many different ways of doing work formerly, and compared with the present-day methods, the more modern ways being most preferable. It is generally known that one of the objects on which this organization was founded was, to enlighten others through its channels and to bring its members close together, to educate and increase their knowledge and earning capacity of each individual member, as well as to aid each other, whereby the party asking for information would receive it, but within certain limits. Many members do not care to divulge certain formulas, and they are not to be censured, but with the information they now possess, and with the added schooling a man can make himself proficient. To hold a position today of great merit, one must be versed in chemistry, posted so that if one's mind is in doubt as to the quality of articles used in making different solutions, the word quality which signifies the best, he must be able to detect the fault at once and obviate any unnecessary trouble.

Until each and every man who is not possessed of this ability in the electroplating business acquires it, just that long will trouble arise and create all manner of trouble and annoyances which could be obviated in short order if this knowledge could be had. No matter what the label calls for, or the trade mark denotes, analyze it and be in a position to say that you are using what is needed and stop filling up your solutions with worthless dope.

Now comes the question. How many men are there employed in the different factories, who are at the heads of departments, such as electroplating, polishing, coloring and

lacquering, that actually know what the solutions contain? They know the supply houses are now, and have been doing all in their power to meet the prices, and are arranging their wares accordingly to suit the purchasing agent, but when the supplies are weighed and put in the solution and trouble arises for some unknown reason, then the head of the department is looked upon as Jack the Fixer. How many men are there here tonight or employed broadcast who can take the articles before applied to the solution and tell what they contain, and if they are as they should be. Then after they are applied can tell whether or not they are correct?

You, gentlemen, will agree with me when I state that every man ought to be well versed on this subject. It is only a short space of time when a man of responsibility will be wanted to fill a high grade position. He will be compelled to qualify and satisfy the management of corporations looking for capable and responsible men. Some will say, "where can I go to secure this information? I need this education and will pay a reasonable sum." This same question has been argued many times, and now, gentlemen, it affords me great pleasure to state that it is only a short space of time when you will have the opportunity of taking a course in a school of chemistry, devoted exclusively to electroplating in all its branches. The principles of this school, in addition to chemistry, are going to teach electroplating from a scientific standpoint.

We have heard repeatedly that platers should know how to test their solutions, but as yet no one has volunteered to show the way. The need of a school where a man of experience can go and get the necessary training, without spending years of study on chemical theories, is a necessity for the advancement of the individual as well as this association.

The old adage that "Knowledge is Power," is nowhere truer than in plating. If we have the knowledge we can proceed to lessen our difficulties when they occur, which is often the case in plating solutions. If we know the amount of salts a plating solution should contain and find after some weeks that the solution is not working properly, we can by analysis find the cause of the trouble. There is no doubt that 95 per cent. of the solutions that are thrown away because they were not working properly could be saved, if a chemical analysis was made of them.

Plans are being completed for the most up-to-date working laboratory for this particular cause. There will be two courses, the first in testing plating solutions, and the second in plating and finishing. Two nights a week during the winter would be sufficient to complete such a course, if interest were taken in the work. Special lessons will be given by actual demonstrations. Knowledge will be developed in the laboratory under the directions of capable persons purely for the benefit of all who are members of this school. The Department of Labor will advocate the employment of graduates of this school, and by so doing will be a guarantee as to their ability. This department, likewise the school, will advertise in trade journals, and also many other ways throughout the United States and Canada, and make known that at last, the school long wanted has materialized.

PERSONALS

ITEMS OF INTEREST TO THE INDIVIDUAL.

THEODORE AHRENS

Theodore Ahrens, president of the National Association of Brass Manufacturers, is the president of the Standard Sanitary Manufacturing Company, with general offices at Pittsburgh, Pa. He was born in Baltimore, September 21, 1859. His parents were poor German emigrants, who reached this country in 1855. His father moved to Louisville, Ky., when Theodore Ahrens was an infant, and about 1860 he opened up a small brass foundry in that city. Mr. Ahrens was educated in the public schools of Louisville, and at the age of thirteen began work as a core boy in his father's little brass foundry. He spent three years in the brass foundry, and five years at the lathe as a brass finisher. At the age of twenty years, Mr. Ahrens left Louisville and worked in some of the principal brass shops in the East, such as Haines, Jones & Cadbury Company, the Haydenville Manufacturing Company and the Nathan Manufacturing Company's plant. When he was twenty-two he returned to Louisville, and went into the plumbing business. In six years he earned $6,000 and with that money purchased an interest in The Ahrens & Ott Manufacturing Company, with which he has been actively connected ever since.

THEODORE AHRENS.

Mr. Ahrens contends that his education as a mechanic and his knowledge of the plumbing business have been important factors in the success he has achieved in the manufacturing and jobbing lines in which he later embarked. During the first fifteen years of his career, as a jobber and manufacturer, Mr. Ahrens spent the greater portion of his time on the road getting acquainted with the trade and its requirements. He is an earnest believer in organization and realized early that no one man could successfully, alone, run a great business. He endeavored, therefore, at all times, to surround himself with men of ability and by the co-operation and efforts of a number of people combined achieved success.

He believes in trade organizations and he has filled numerous positions in the organizations of brass manufacturers soil pipe manufacturers and enameled iron ware, as well as in the jobbers associations, such as the Central Supply Association and others. He has always had the reputation of being a hard worker, but work never seemed a hardship to him, as he gets a great deal of pleasure out of business and by being connected with a great live hustling institution, such as he is president of. Those who know him intimately claim he is one of the best informed men on the manufacture of plumbing goods in the country.

F. G. Taylor, formerly of Chatham, Ontario, has moved to Sturgis, Mich., where he will open a plating and polishing plant, which will be in operation about July 15.

It is reported that Franklin A. Taylor has resigned his position as general manager of the Randolph-Clowes Company, Waterbury, Conn. No successor has as yet been announced by Charles L. Miller, president and owner of the company.

Joseph V. Woodworth, consulting engineer at the New York office of the Taft-Peirce Manufacturing Company, Woonsocket, R. I., has resigned and accepted the position of consulting engineer and New York representative of the Boston Pressed Metal Company, Worcester, Mass., with offices in the Tribune building, 154 Nassau street, New York City.

Richard Law, formerly connected with the Lumen Bearing Company, of Buffalo, N. Y., has accepted the position of foundry foreman and metallurgist of the new Canadian plant of the H. Mueller Manufacturing Company, which is to be started in Sarnia, Ontario, in the near future.

The friends of Ferdinand Deming (the rolling mill master mechanic of Waterbury, Conn.) will be glad to know that he is progressing steadily in England and now holds the position of chief engineer in the plant of Allen Everitt, Ltd., Southwick, near Birmingham, makers of wrought brass in all forms. Mr. Deming has been instrumental in greatly increasing the seamless tubing output of the plant, and the management is so pleased with his work that they have provided him with a house in which to live, where he enjoys himself living somewhat like a lord of the manor, and in entertaining any of his American friends who chance to call.

DEATHS

Douglas Durnan, foreman plater for the Toronto Silver Plate Company, Toronto, Ontario, for a number of years, recently died.

Henry Iden, a wealthy manufacturer of brass and bronze chandeliers of New York, died at his home in Pelham Manor on Sunday, May 4. He left an estate valued at over a million dollars, one hundred thousand dollars of which is bequeathed to Cooper Union, New York, for the advancement of science and art.

Seth Clinton Catlin died at his residence in Bloomfield, N. J., on June 4. Mr. Catlin was the inventor and patentee of the "Nonesuch" electroplating machine and the "Nonesuch" carboy rocker, for which Rockhill & Vietor of New York and Chicago have the sole selling rights. Mr. Catlin was over seventy years of age, and had been until a year or two ago actively associated with the electroplating industry for a period of nearly forty years.

Charles Bruce Jones, the only son of Louis H. Jones, president of the Detroit Brass and Rolling Mills, Detroit, Mich., died at the family home in Detroit after an illness that has extended over six years. The young man was 28 years old and had been in poor health since he suffered an injury in athletics while attending Yale. He was forced to give up his studies and entered business pursuits first with the Diamond Manufacturing Company here, and later with the Detroit Copper and Brass Rolling Mills, but at intervals had to leave to seek a restoration to health.

BUSINESS REPORTS OF THE METAL INDUSTRY CORRESPONDENTS IN THE DIFFERENT INDUSTRIAL CENTERS OF THE WORLD.

PROVIDENCE, R. I.

The first six months of the year has found the books of the majority of the local firms engaged in the metal trades balancing pretty closely to what they did a year ago. There has been no boom in any of the metal lines, but a steady continual business has rounded out a very satisfactory aggregate. July opened with many plants closed down for the annual overhauling of stock, tools and boilers, a general renovation and improving and a vacation for the help. What the last months will bring forth it is hard to prophesy. There are many who are very optimistic, but there is a growing pessimism that the presidential campaign is going to have a very disastrous effect upon business generally throughout the country. There is the same cry every fourth year that the presidential election, or rather the agitation and uncertainty of results, will cripple business. Manufacturers and business men have been gradually outgrowing that time-worn bug-a-boo. This year, however, conditions are somewhat different and many who otherwise pay no attention to such ideas are conservatively withholding any business activities until later in the year, at least.

The four-story brick building, 12 Beverly street, was visited by a fire on the night of June 1 that caused more than $10,000 before the flames were extinguished and the damage by smoke and water adjusted. This is the third fire in the same building since March 3, the fire of that date doing more than $40,000 damage. The fires have started in or near the shop of H. W. Winnerman & Company, manufacturers of buff wheels and other supplies for manufacturing jewelers. Large quantities of lacquer is used in the establishment, and it is claimed that this is responsible for the frequent fires. Other firms in the building, all of whom are affiliated with the jewelry industry, are: Alfred Vester & Sons Company, Roland & Whylock, Mrs. Anthony Heldt, Smith Manufacturing Company, Nicholas Palamides, and Blacher Bros.

The Bay State Jewelry Company has been incorporated under the laws of Rhode Island to manufacture and deal in jewelry. The capital stock is $1,000, divided into 100 shares of $10 each. The incorporators are Frank Nolan and Albert G. Saart, of Attleboro, and Arthur E. Nunro, of Providence.

The National Electroplating Company, the newly-established concern on Calender street, this city, have decided to confine their business to nickel and silver plating of large articles not connected with the jewelry or silversmith business.

The Standard Jewelry Company of Arlington, Mass., has combined with the Crown Novelty Company, of this city, and hereafter the business of the two concerns will be conducted under the corporate name of the Crown Novelty Company, at 159 West Exchange street, this city.

The S. O. Bigney Company, a corporation constituted for the purpose of engaging in the manufacture and sale of jewelry and all business incidental thereto, has been granted a charter under the laws of Rhode Island by J. Fred Parker, Secretary of State. The incorporators are Sidney O. Bigney and Augusta B. Brundage, both of Attleboro, Mass., and Harold O. Bigney, of Providence. The main office of the concern will be located in Providence, but the manufacturing plant will be located in Attleboro. The capital stock is $300,000.

The Providence Metal Spinning Company, 95 Pine street, has been doing a large amount of business during the past six weeks or two months, which indicates that many of the large manufacturers are preparing for a fall trade. H. J. Astle & Company, of this city, have recently installed a number of the Boland machinery for which the concern is the agent, including a large vacuum system for St. Anthony's Church, Providence; blower and sand blast for the Heintz Art Metal Shop, Buffalo, N. Y.; blower and motor for Smith Bros., manufacturing jewelers, 14 Blount street, Providence; No. 5 pressure blower for Leach & Garner Company, manufacturing jewelers, Attleboro, Mass., and blower and motor for MacPherson-Roubaud Company, manufacturing jewelers, this city.—W. H. M.

BRIDGEPORT, CONN.

JULY 8, 1912.

The local trade situation in the metal industry appears to be steadily improving, and reports received show a considerable amount of orders ahead in most plants. Business in surrounding cities also appears to be good, a number of factories operating both day and night. The bronze and aluminum shops report a very good business, which is evidenced by the fact that they have lately very materially added to their force of workmen.

The State Trade School, located in Bridgeport, which was established about two years ago by the State, has proven very successful, and, on account of its popularity and rapid growth, the present quarters of the school are fast becoming inadequate.

There are now about 450 names on the night school waiting list. A very large percentage of the work done by the students is on contracts for outside firms, and, therefore, the instruction is of a very practical nature. Recently the local Manufacturers' Association appointed a special committee to consider the subject of how much time should be allowed by manufacturers on their regular three-year apprenticeship contracts to graduates of the school, and after a thorough investigation the committee recommended that the full two years' time spent in the school be allowed, so that a graduate will only have to spend one year in a factory in order to become a journeyman at the trade he has studied.

The eighth annual outing of the Bridgeport Manufacturers' Association will be held on July 17, and gives promise to be the largest and best ever undertaken by the local association. A genuine Rhode Island clam bake will be served, after which there will be a vaudeville entertainment and various other athletic events. Suitable prizes will be contributed by local manufacturers.

The plant of the Locomobile Company is very busy, running night and day, and plans are now under way for the erection of a new addition which will be devoted to the manufacture of automobile trucks exclusivly. It is only recently that this company has taken up the subject of manufacturing trucks, but it is reported that the results so far have been very successful, and it is believed that this work will become an important factor in the company's future business.

It is understood that extensions will be made to the American Graphophone Company's plant which will increase its output about 50 per cent., the large demand for machines and records making this step necessary. The quarterly dividend on this company's preferred stock, payable August 15, will be increased from 1 per cent. to 1¼ per cent.

The United States Gauge Company, manufacturers of Bourbon Pressure and Vacuum Gauges, has leased for a term of years the two upper floors of the factory building at Water and Thomas streets. This will be a branch of their works now located at Sellersville, Pa.—F. A. B.

UTICA, N. Y.

JULY 8, 1912.

The Divine Bros. Company, manufacturing buffs and polishing wheels, is one of the oldest and largest concerns in America producing these goods and probably in the world, and the only firm making a complete line. The only feasible and practical way to make buffs and wheels successfully is in large quantities. Seventeen years ago there were fifteen firms making these, and today there are only three of any size. To carry on the business today such a factory has to keep constantly on hand cotton goods running in value from $75,000 to $100,000. Another very important detail in such a large volume of business is that the cloth must be cut up from 1 to 40 ins. in diameter without waste. Many think it is easy, as cotton cloth is cotton cloth, but the details are enormous and prices so close that only by doing an immense business can it be handled with a profit. It cannot be successful to make them in small quantities. The wide knowledge and experience met with in the metal finishing trades, using abrasive friction processes, understand that the best is the most reliable. The business must be conducted on broad lines, the capital necessary to conduct it is large, owing to the necessity of carrying large stocks of the various grades of materials called for. The compounding of sizes to produce the greatest value from a certain number of yards of material is an exact science, and a short life attends most of those concerned in the business. Apparently, on the face of it, it seems simple, some thinking that with a sewing machine, cotton goods, a press, etc., they can start in business; but this is not so. The business has been conducted in small shops in a haphazard way, so that standardization has been very difficult, and success can only be looked for after many years of hard labor and experience, with abundant capacity and outlet sufficiently far reaching to utilize every particle of cloth used in all sizes of buffs. The finishing end of the business must be handled with economy, and it takes a long headed man to figure it out. The prices of buffs are based on the price of cotton goods, and are stiffening up, and higher priced buffs may be looked for.

The firm of Divine Bros. Company has grown so fast and the factory has been enlarged twice by the erection of new buildings. A new four-story building, 46 x 115 ft. in size, has been built, that employs fifty extra hands, and means an increase in the output of $200,000 to $250,000 more than it was before. The annual output at present consumes several million yards of piece goods for open or loose wheels, and the product of their sewed buffs runs into the hundreds of tons annually. They are doing now $100,000 more business than last year, and have on the books orders unfilled of $100,000 worth. They will also take up a new line, which is the manufacture of wheels for automobiles, trucks, for pulleys, etc. It has an iron center, with cloth tread, and is a success.

The Seneca Brass and Plating Works, 60 Seneca street, has been in business only two years, but business has been on the increase, and is better than last year. They make gas and electric fixtures, do a jobbing plating business, and have added a zinc plating plant; also expect to put in gold and silver plating. The Spitzli Manufacturing Company, 8 Devereaux street, are doing now an entirely jobbing plating business and gave up manufacturing. They have a few large contracts, doing a great deal of special finish work, have put in a 1,000 ampere dynamo, and enlarged the polishing room. The buffing, scrubbing, plating, polishing and lacquering departments have all been enlarged, and each one has a separate room by itself. Are having a run on black finish auto lamps. Have put in a Hanson & Van Winkle polishing lathe, which is one of the best machines they have. William Albert, the superintendent, graduate of a German university and a member of the Electro Platers' Association, was the first man to produce the gun metal finish on novelties, although it had been done before on watches. The firm has an order for 50,000 toilet paper boxes; another order of 5,000 every year, and an order for 250,000 brass rods.

The Standard Brass Company has moved its plant recently from 31 Catherine street to 25 Whitesboro street, which will give them twice as much room as before and more prompt shipments can be made. They make nickel plated plumbing supplies, and have added a new line of bent tubing lavatory traps. Also expect to add other lines as soon as possible. The Bossert Construction Company are making sheet metal stampings for automobile lines and switch boxes and outlet boxes. They do no casting, but all sheet metal work, in brass, copper and tin. J. R. Jones is the general manager, and C. Kachel superintendent. An office has been opened in the Ford building, Detroit, in charge of William Vesey. R. B. Corey, who had the New York office, has given it up, and it is now in charge of William S. Brown, at 3 West Twenty-ninth street.

F. M. Merriam, of 3 Carton avenue, brass founder, is seventy years of age, and has taken THE METAL INDUSTRY for ten years. He says there is too much cutting of prices, and considerable of the work here goes out of the city. He does not expect to be in the business many years more. Is also making some good aluminum castings. Nathan Katzman has succeeded Berkman & Katzman, scrap dealers in brass, copper and metals, at 24 Broadway. He has quite a good trade in supplying the foundries. The Utica Fixture Company, of 22 Hubbell street, make brass and service gas cocks, meter goods, and are way behind orders. They have enlarged and built a new factory, 24 x 100 ft. in size. The meter goods is a new line they have taken up. Have put in a lot of new machinery, and will add more to the equipment, so as to turn out 4,000 cocks a day. The capacity of the plant has been doubled. Have automatic machines to turn out cocks from ⅜ in. to 2 ins., and one man runs two machines, the inside of the cocks being ground with powdered garnet. They have put in one big machine, and it drills and tops the cocks at both ends at once, and is the only machine in use. It will do 4,000 cocks a day. About 8,000 lbs. of brass are melted a day in the foundry, which is up to date. They have three melting machines; each one will melt 600 lbs. of brass an hour. The carts that carry the metal from one part of the foundry to another will hold 1,700 lbs. each. All the molding is done by four machines. There are five men on the road, and 115 hands at the plant. The cost of the new building and improvements has been $12,000, and the entire plant is in charge of C. R. Mizner.—H. S.

ROME, N. Y.

JULY 8, 1912.

Great progress is being made on the many improvements under way here as mentioned in the June issue. Freight matters are being taken up in a very systematic manner by the Chamber of Commerce. Rome is bound to have many more industries within the next few years. The improved shipping facilities have opened up a vast territory for factory sites, and as copper and brass products can be secured from the large local companies without much delay, Rome bids fair to equal some of the other large cities. When Rome was first built it was planned way ahead. It is the next city to New York in point of area in the State. The city is laid out in uniform blocks, thus permitting easy and natural growth. Now that Rome is growing, its future welfare is being carefully watched and difficulties which many cities encounter will be avoided.

The large output of the local copper and brass industries have grown to such an extent that statistics now show that Rome stands fourth in tonnage of cities between New York City and Buffalo. The Rome Brass & Copper Company have recently moved into their new Tube Mill, and it is the hope of officials to keep up with orders on this class of material. With the tripled capacity the new mill gives this will be much easier. This concern employs 1,500 hands instead of 400, as mentioned in previous issue.

The Rome Manufacturing Company still continues to have their large quota of the kettle, boiler and pot business. They have about 700 hands and it is necessary to keep some departments working all night to keep up with orders. This company, in addition to their kettle, boiler and pot business, have a large trade in bedstead tubing and trimmings, copper flue ferrules and various other articles of brass and copper.

The Rome Wire Company, which once went under the name of The Wire & Telephone Company of America, have recently put up a large addition to their plant. This concern sells its product under the trade name "Romroid" and consists of magnet wire, bare and tinned copper wire, annunciator, office, piano, telephone and rubber-covered wire. The Rome Sanitary Manufacturing Company since increasing their capital stock have changed their name to Rome Sanitary Company. They make plumbers' supplies and have several important patents from which large sales are expected.

The James A. Spargo Wire Company make telephone and telegraph solid wire and wire window screen cloth. The output is 4,000,000 to 5,000,000 pounds a year. Are installing more machinery in the wire cloth department, making steel, brass and bronze, fine and coarse mesh. The latter part of 1911 was quiet, but business has picked up since.

The smallest size of wire this concern makes is No. 40, which is .003 of an inch, up to No. 4, which is .21 of an inch, and they cater especially to the fine wire demand. The Rome Tube Company have moved most of their equipment to the new building, which is an extension to the plant of the Rome Metal Company. The latter have succeeded the former and are all controlled by the Rome Brass and Copper Company. The Rome Wire Company make both insulated and non-insulated copper wire, and have been busy operating night and day for two years. It is hard to supply the demand with them, while other lines generally are reported quiet. Are adding gradually to the force, with a slow and steady growth to the business. January, February and March were three of the best months they ever had.

The Maxwell Engineering Company is a new firm, conducted by Harry B. Maxwell, who used to be in the harness manufacturing business and was once publisher of the Harness Gazette. He has been in the pattern and gas engine business, but now has started a brass, bronze and aluminum foundry, with a specialty of bearing bronze. He says fuel oil has gone up to six and one half cents; it is used here considerably and if it goes higher some may go back to coal. Expects to put in one of the modern French molding machines, which will turn out castings as fast as one can shovel sand.

W. J. Doyle makes brass, bronze, composition and aluminum castings and he is now in larger quarters at 130 South James street. Are also manufacturing light machinery and have increased the factory for turning out larger quantities of plating work. A. S. Noonan Tool and Machine Works are making a lot of brass goods, such as a new patent adjustable bracket for lamps, to be used on motorcycles, which will take the largest lamp made. Also making new tool holder, which can also be used as a pump for either front or back tire and requires no changing around. Make a watch holder for the motorcycle, a new device for holding pennants; make solid aluminum doors for automobiles, weighing eighteen pounds, which always stays there and does not warp. Also chisels and punches, as well as a new valve trueing tool for combustion motors on the motorcycles, a valve seating tool. They have been doing considerable brass, aluminum and nickel plating.

The Rome Bronze Company is practically a new firm, and is probably the only such firm in the country, with a foundry, making signs and tablets only. Their signs and memorial tablets are made of solid bronze casting, hand tooled, not stamped. The etched signs are baked three times, and the raised letters are cast on the solid back of the metal base. A cost system has been installed, and applies the most up-to-date and efficient and scientific management. Have ten salesmen on the road. William K. Hall is the president and treasurer, and J. E. Clark, manager. The Rome Turney Radiator Company are running to the usual capacity, making brass and copper radiators for automobiles. The Tyler Specialty Company, of 121 West Dominick street, have quite a business in making the covered sanitary pail, made of charcoal tin, having a one piece top. Also make the Nosmoak frying pan, which has hot air chambers to prevent the smoke from passing on the outside of the pan.

The Stevens Manufacturing Company is a new firm and is officered by S. B. Stevens, president; H. A. Foss, vice-president; T. J. Wetzel, treasurer; P. J. Daley, secretary and general manager. A New York office has been established at 17 West Forty-second street, New York, and 1517 Michigan avenue, Chicago, and 100 Boylston street, Boston. They are making carbureters of brass, of their own design, its noteworthy features being economy, greater efficiency and flexibility. These results have been attained by the combination of two carbureters in one, the smaller one taking care of the low speeds, and both together giving the higher power and maximum efficiency. This firm will put in, or have put in light drill machinery and Monitor lathes. This factory is located at 130 South James street. Thomas J. Wetzel is in charge of the New York office, and Brown and Cain at Chicago.

DETROIT, MICH.

JULY 8, 1912.

No material change has occurred in the brass and aluminum business in Detroit during the last thirty days. Business is good in both these branches of industry and promises to continue at its present state for some time to come. The demand is good for all plumbers' supplies and other material relating to the building industry. There seems to be a general building epidemic all over the country that demands goods.

The automobile industry continues at a high water mark, and there will be no let up for several months, if there is any at all. Every brass factory in Detroit is taxing its capacity to keep up with the demands from the plants that are working to place the greatest number of cars on the market within a given time. In discussing the uses of metals in the production of automobiles Charles Splitdorf declares there is an ever-increasing demand for platinum and iridium as used for ignition purposes. The automobile industry in Detroit is causing a great demand for this product from manufacturers all over the country who are producing ignition devices.

One of the important changes in the automobile industry in Detroit during the last month has been the complete reorganization of the sales department of the Studebaker corporation in Detroit. The changes have, the company declares, enabled the concern to greatly increase its sales during the last three weeks. The new head of this department is Ernest R. Benson, and his assistant, who aided him in this great task of disposing of so many automobiles, is Arthur I. Philip.

W. L. Abate, a former vice-president of the American Institute of Metals for New York and a most active member who was, until recently, general manager of the Sanitary Manufacturing Company, with headquarters at Louisville, Ky., is now enjoying a well-earned vacation in this city.—F. J. H.

TRADE NEWS

TRADE NEWS OF INTEREST DESIRED FROM ALL OF OUR READERS. ADDRESS THE METAL INDUSTRY, 99 JOHN STREET, NEW YORK

ADDITIONAL TRADE NEWS WILL BE FOUND UNDER "CORRESPONDENCE."

The Whitlock Coil Pipe Company, Elmwood, Conn., have installed a copper plating department. Heretofore the company have been doing nickel plating only.

It is reported that L. M. Hecht, head of the Hecht Brass Works, of Chicago, Illinois, is contemplating the establishing of a factory at Chattanooga, Tenn., for the manufacture of light shelf hardware.

For the first time the big spoon used at Alumni Day at the University of Pennsylvania was made of aluminum silver, and was made by Bailey, Banks & Biddle. These spoons were formerly made of wood.

The Lumen Bearing Company is adding an 1,800 square foot addition to its plant at Buffalo, N. Y., to take care of aluminum casting work. The company reports a very favorable year up to this time, and orders in excess of those received in the past.

The Weidlich Manufacturing Company, manufacturers of gold and silver plated ware, Bridgeport, Conn., report, through L. Weidlich, president, that the addition to their factory is 64 by 45 feet, two stories. This department is to be used for finishing, packing and shipping.

The Standard Brass Works, Detroit, Mich., have prepared plans for two new buildings. The main structure will be 60 by 155 feet, two stories and basement, and of regular mill construction. The other building will be a one-story foundry, 60 by 100 feet, of brick and steel.

The Excelsior Plating Works, Lancaster, Pa., report, through J. M. Kreider, proprietor, that they are about to install a thoroughly up-to-date plating plant, and are prepared to do nickel, silver, copper and brass plating. This concern also makes brass, bronze and aluminum castings.

It is announced in Waterbury, Conn., that the Autoyre Company have purchased the novelty manufacturing business of the Baird Machine Company at Oakville, and will manufacture metal goods. The incorporators of the Autoyre Company are J. H. Cowles and R. G. Stewart, Waterbury, and F. M. Peasley, Cheshire, Conn.

The Genesee Metal Company, Rochester, N. Y., report through F. W. Reidenbach, general manager, that they have recently let contracts for an addition to their warehouse of a brick building 37 by 77 feet. They are also installing a new shear and a Logemann Bros. cabbaging press for putting copper and brass in crucible shape.

The anual outing of the employees of the Light Manufacturing and Foundry Company, of Pottstown, Pa., will be held at Ring Rocks Park on Saturday, July 13. This is to be their ninth annual event, and will start with a street parade, consisting of three divisions, machinists, core makers and foundry men. It is planned to make this the best outing the men ever had.

L'Aluminium Francais, which has been organized with a capital of 15,000,000 francs, has purchased the hydro-electric plant, together with houses and a portion of the land of the North Carolina Electric & Power Company at Whitney, N. C. The French company is planning to organize a company, to be known as the Southern Aluminum Company, with a capital stock of $8,000,000, and will erect a plant for the manufacture of aluminum.

The Hawthorne Manufacturing Company, Bridgeport, Conn., who manufacture patented novelties of all kinds, among which are included "Old Sol" motorcycle lamps, brackets, generators and the Hawthorne four cylinder automobile hand air pump, have now installed eight mechanical plating barrels for copper and nickel plating, and expect to install more at an early date. This apparatus was obtained from the Hanson & Van Winkle Company, Newark, N. J.

The Baltimore Tube Company, Baltimore, Md., have purchased from Ira L. Hawkins the tube mill machinery for the drawing of seamless tubing, which was installed in the Hawkins Mill at South Britain, Conn., by Ferdinand Deming. A description of this mill was published in the September, 1909, number of THE METAL INDUSTRY. This company have also contracted with the Rockwell Furnace Company, New York, for the installation of large overfired accurate temperature annealing furnaces for brass and copper tubing. Oil will be used as fuel.

The Pullman Automatic Ventilator Manufacturing Company, York, Pa., reports a large demand for its new type of swinging top chimney cap, made under patent rights secured from the inventor, John M. Cromley, the engineer of the company. This cap has been designed with the idea of supplying something cheap, and at the same time efficient, which may be kept in stock by tinners and roofers. The cap is made in 6 inch, 7 inch and 8 inch sizes, and is put up in crates of not less than half a dozen, either in one size or assorted sizes. The ventilator is made of galvanized iron, and has a brass-ball bearing, which will not corrode, causing positive action of the ventilator at all times. Full information may be had by applying at the factory, at York, Pa.

The Ford Motor Company, Detroit, Mich., for their new foundry for making automobile engines, have contracted with the Rockwell Furnace Company, New York, for one of the largest installations of small core ovens in the automobile field. This installation consists of 24 ovens containing 88 shelves. The ovens are of the type known as the "Reel Type" core ovens, each shelf being a complete circle about 5 feet in diameter turning independently on a central axis. One-half the shelf is in the oven with the cores on it being baked while the other half of the shelf is outside, serving as a rack. Producer gas will be used as fuel. This type of core oven is especially adapted for automobile work in that it does away with the jar and jolt which arises when car type ovens are used.

Proposals will be received at the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., until 10 o'clock a. m., July 23, 1912, and publicly opened immediately thereafter, to furnish at the navy yard, Brooklyn, N. Y., a quantity of naval supplies, as follows: Sch. 4669, lanterns, signal, white, brass; screws, machine, brass; Sch. 4674, nuts, semi-finished, brass; brass, sheet, soft; copper, tubing, seamless. At the navy yard, Philadelphia, Sch. 4674, copper, ingot. At the navy yard, Washington, D. C., Sch. 4667, brass tubes. Applications for proposals should designate the schedules desired by number. Blank proposals will be furnished upon application to the navy pay office nearest each yard, or to the Bureau.

T. J. COWIE, Paymaster-General U. S. N.

The Baird Machine Company, who have recently moved into their new plant in Bridgeport, Conn., report increasing business the past month, showing the largest sales in the history of the concern. For about eight years it has been necessary for this company to practically continue overtime to keep up with orders, some winters operating both a day and night gang. Several times the capacity of the plant has been about doubled,

hoping to do away with this overtime, and particularly so when the new plant was completed, where greater and better facilities were provided than ever before. Overtime has had to be continued, however, and a night gang again seems necessary to keep up with sales. This concern makes a specialty of special and standard automatic wire working machinery, as well as presses, eyelet machines and tumbling equipment, and claims that it is the strongest organization in the country for special automatic machinery.

A new concern recently established at Chesley, Ont., is the Canada Beds, Limited, manufacturers of iron and brass bedsteads. This company is situated in the town of Chesley on the main line of the Grand Trunk Railroad, between Toronto and Owen Sound, and is claimed to be the most up-to-date bedstead factory in the Dominion. The factory is a brick building 300 by 50 feet, which is divided into fifty departments so that the work can be done swiftly, perfectly and economically. L. H. Grover, who is in charge of the designing and carrying out of the new ideas of this company—the manufacture of their beds—has a continental reputation, and is well and favorably known to the trade as a most capable and efficient director. J. H. Gardner is the secretary and treasurer of the company, and has complete control of the buying, selling and managing, and there is no doubt but that the future success of the company is assured.

FIRES

The plant of the Detroit Brass & Copper Rolling Mills, Detroit, Mich., was only slightly damaged by the fire which destroyed the plant of the Diamond Manufacturing Company on June 10. L. H. Jones, who is president of both companies, estimates the loss of the Diamond Company at about $250,000.

Seven buildings were destroyed by a spectacular fire on Van Rensselaer Island, south of Albany, N. Y., on the afternoon of June 4. The fire started in what was formerly known as the Perry Stove Company (now owned by the Albany Foundry Company, which also controls the Troy Nickel Works), causing this company a loss of $100,000. The Albany company report, through J. R. Marshall, general manager, that they have completed plans for carrying on the business and for rebuilding their three buildings. The fire then spread to the plant of the Albany Waste and Metal Company, destroying three buildings and causing a loss of $75,000. This plant will also be rebuilt as soon as possible.

REMOVALS

John J. Dalton announces his removal from 24 New Chambers street to 18-20 Jacob street, New York, where he is prepared to do plating of any description, also polishing, lacquering and oxidizing in all colors.

BUSINESS TROUBLES

The creditors of the United States Motor Company, New York, have agreed to extend for ninety days from June 15, 1912, the time for the payment of the notes and claims held by them, and have further agreed to accept therefor the notes of said company dated June 15, 1912, payable ninety days from said date, with interest at the rate of six per cent. A statement of the current assets and liabilities, dated May 31, 1912, shows an excess of assets over liabilities of $6,199,953.66. In addition there is over $10,000,000 in plant account and other investments to be added to the assets, and also an indebtedness of $6,000,000 of five-year notes, due in 1916, but which would be immediately due if the company were to go into the hands of the receiver.

INCREASE OF CAPITAL STOCK

The Youngstown Bronze & Iron Company, Youngstown, Ohio, have increased their capital stock from $50,000 to $65,000.

INCORPORATIONS

Business organizations incorporated recently. In addressing them it is advisable to include also the names of the incorporators and their residence. Particulars of additional incorporations may frequently be found in the "Correspondence" columns.

The General Aluminum & Brass Castings Company, Detroit, Mich. Capital, $75,000. To carry on a general foundry business.

The Standard Meter Company, Brooklyn, N. Y. Capital, $400,000. To manufacture water meters, etc. Incorporators: F. A. Ross, J. Hobran, Jr., and R. J. Doyle, all of Manhattan, N. Y.

The Aluminum Specialty Company, Pittsburgh, Pa. To manufacture and deal in aluminum ware. Incorporators: F. Klenbansky, J. Steinberg, Pittsburgh, and aJcob Morris, Canonsburg, Pa.

The Aluminum Manufacturing Company, Kansas City, Mo. Capital stock, $10,000. To manufacture aluminum utensils. Incorporators: G. M. Pabst, Rudolph Best and others of Kansas City. A new plant will be erected.

The Maiwurm Aluminum Works, Erie, Pa. To manu facture kitchen utensiles and other articles made of aluminum. Incorporators: Paul Maiwurm, Dale Maiwurm and Julius E. Curtze, all of Erie. The company will equip a new plant.

The Buckeye Brass & Manufacturing Company, Cleveland, Ohio. Capital stock, $20,000. To manufacture plumbers' brass goods and specialties. Incorporators: David M. Strauss, Henry Selker, G. J. Almendinger, B. J. Sawyer and Albert Stearns. This company will succeed the Buckeye Brass & Pattern Company, whose plant at 1807 Columbus road will be retained.

PRINTED MATTER

Core Compound: The S. Obermayer Company, Cincinnati, Ohio, have recently sent out a leflet in the interests of their Kantbeat Dry Core Compound which they claim is superior to flour.

Manganese Bronze: The Ajax Metal Company, Philadelphia, Pa., issue a small folder giving some of the most valuable information relating to their Ajax manganese bronze, which is guaranteed to be the strongest bronze on the market.

Furnaces: The W. S. Rockwell Furnace Company, New York, have issued catalog No. 9, which gives a complete description of the Rockwell light forging, tool dressing and heat treating furnaces. Further particulars may be obtained by sending for the catalog.

Bearing Metal: The Palmetto Metal Company of Chicago, issue a handsome little booklet giving information relating to the various lines of babbitt and bearing metals manufactured by them under the name of "Palmetto." The booklet contains a handsome engraving of R. J. Fisher, president of the company, and gives some important facts regarding the products of the company.

Tanks: A handsome catalog relating to all kinds of tanks is issued by the W. E. Caldwell Company, Louisville, Ky. The catalog consists of 92 pages and contains handsome illustrations of the interiors of the various departments of the plant of the Caldwell Company, and also complete descriptions of the various kinds of tanks and products manufactured by them. A complete price list of tanks for all purposes is also given.

Voltite: A very interesting little pamphlet has been issued by the American Voltite Company, 225 West 39th street, New York, which gives, in addition to a photograph of the inventor of Voltite, A. T. Firth, a complete description of the inven-

tion, its unique merits and an exposition of its many uses for the home and shop. The booklet is very attractively gotten up and will repay the time spent in reading it through. Copies upon request.

Grinding Wheels: H. A. Stiles & Company, Boston, Mass., have issued a booklet, printed in two colors—red and blue—in the interests of Ottoman brand of grinding wheels and abrasive materials. A description is given of the various kinds of wheels manufactured and a table is inserted in the selection of grades of wheels necessary according to the class of work desired to be handled. A complete price-list is also included.

Bronzes. The Lumen Bearing Company, brass founders, Buffalo, N. Y., are issuing a reprint of a paper written by J. A. Capp, of the General Electric Company, Schenectady, N. Y., which is of great value to anyone interested in the fabrication of bronzes. The paper is entitled The Elastic Limit of Manganese and Other Bronzes, and presents an interesting discussion of making physical tests of these bronzes. The company will be glad to send copies to interested parties.

Magnesium Metal: C. W. Leavitt & Company, 30 Church street, New York, issue a card in the interests of their magnesium metal, which states that as it is lighter than aluminum it offers the best means for producing castings of the lightest weight. Magnesium also is used for the elimination of objectionable oxides in the melting of mixtures containing aluminum, copper, nickel, spelter lead and tin. For further data apply to the above company.

Acid Pump: The Hanson & Van Winkle Company, Chicago, illustrate their acid pump in a circular recently issued. They claim that acids can be handled with perfect safety by the use of their pump; that the pump forces air into the carboy, which raises the acid up and out through the discharge tube; that one man can get out what he wants without assistance, and the possibilities of accidents are obviated. These pumps may be ordered on approval.

Joseph Dixon: A very unique publication has been issued by the Joseph Dixon Crucible Company of Jersey City, N. J. This is a biography of the commercial work of Joseph Dixon, who is styled by Elbert Hubbard as one of the "world makers," or one of the twenty men who had most influenced the world. The biography is a product of the Roycrofters at East Aurora, N. Y., and constitutes 24 pages of matter, printed in red and black on heavy paper with deckle edge. Copies of this work will be mailed upon application.

Electroplaters,' Polishers' and Buffers' Supplies: D. B. Moyer, Detroit, Mich., has issued a comprehensive catalog giving descriptions and illustrations of the line of supplies for platers, polishers and buffers handled by him. This line includes polishing and buffing lathes, dynamos and motors, switch boards, etc. In addition to the articles enumerated, Mr. Moyer manufactures and handles practically everything required by the various departments of the finishing of metals. Copies of the catalog will be mailed upon request.

Plating and Polishing Supplies: Chas. F. L'Hommedieu & Sons Company, Chicago, have issued a new illustrated catalog and price list of electroplating and polishing supplies and machinery, dynamos, polishing lathes, chemicals, lacquers, acids, voltmeters, grinding machinery, polishers' and buffers' supplies and reliance plating barrels. This catalog shows a remarkable improvement over the one previously issued by this company and shows to what great extent the business of this hustling concern has grown during the past few years.

CATALOG EXHIBIT

An exhibition of every kind of catalog may be seen at The Metal Industry office, 99 John street, New York. The Metal Industry is prepared to do all of the work necessary for the making of catalogs, pamphlets, circulars and other printed matter. Estimates will be furnished for writing descriptions, making engravings, printing, binding, for the entire job from beginning to end or any part of it.

ADNEWS

The Foundry & Machine Exhibition Company again urge manufacturers of plating and foundry supplies to make arrangements for exhibition space at the Buffalo convention in September. Allotments of space will be made July 15, so prompt action is advisable.

Owing to the impracticability of getting out a catalog covering such a varied line of special machinery, etc., as designed and built by The Baird Machine Company, Bridgeport, Conn., this concern has brought out a Master Bulletin or "Brief Bits 'Bout 'BAIRD' Machinery," giving a general idea of its complete line.

The Oven Equipment & Manufacturing Company, 997 Dixwell avenue, New Haven, Conn., are advertising the Crawford Sectional Ovens, equipped with their enclosed flame burner. The special features which they emphasize are the low fuel cost, accurate heat regulation, purity of oven atmosphere and excellent insulation. Their catalog will be sent on request.

L. Lewis, 2 and 4 Paterson avenue, Hoboken, N. J., dealer in new and old metals, has a card in this issue. Mr. Lewis makes a specialty of scrap metals for brass founders, and buys and sells brass founders' ashes, drosses, skimming, etc.

The Cleveland Platers' Supply Company, Cleveland, O., offer to ship, on approval, orders for their electric cleaning compound, which is well known to the plating trade.

The Roessler & Hasslacher Chemical Company, 100 William street, New York, are devoting their advertisement this month to Trisalyt, the new triple metallic salt for electro-plating brass, copper, bronze, zinc, gold and silver. Trisalyt is already used by several hundred concerns.

In their advertisement this month the Hanson & Van Winkle Company, Newark, N. J., call attention to their new and complete catalog No. 20, 1912, which contains much information of value to platers, polishers, galvanizers, metal goods and jewelry manufacturers. Requests for copies of this new catalog will receive prompt attention.

The Electrolytic Process Company, 225 West 39th street, New York, have an announcement in this issue regarding their excellent facilities for doing contract and job plating and finishing of all kinds, their specialty being antique finishes and chandelier work. The company claims to have the finest plating plant in America. Their Department B is equipped with solutions for nickel, black nickel, brass, copper, bronze, silver and gold plating, mechanical tumbling barrels, and complete polishing and lacquering departments. Department A is devoted to galvanoplaster work, and to a process for depositing a non-corrosive, non-peeling, nickel-steel alloy on metal, leather, wood, celluloid and other substances; also a process for producing nickel-steel electrotypes, embossing dies, stamps, etc.; a chemico-mechanical process for enlarging or reducing statuary and decorative objects of plaster or metal to any size desired, and a photo-modeling process for reproducing direct from the flat original portraits, engravings, designs, etc., in plaster or metal, and in relief or intaglio. The processes controlled by the Electrolytic Process Company are the inventions of Osciar A. de Polo, who is general manager of the company.

INQUIRIES AND OPPORTUNITIES

Under our directory of "Trade Wants" (published each month in the rear advertising pages), will be found a number of inquiries and opportunities which, if followed up, are a means of securing business. Our "Trade Want Directory" fills wants of all kinds, assists in the buying and selling of metals, machinery, foundry and platers' supplies, procures positions and secures capable assistants. See Want Ad. pages.

METAL MARKET REVIEW

NEW YORK, July 8, 1912.

COPPER.

The copper market has been nothing but bullish and prices touched 17¾ for Lake, 17⅝ for Electrolytic and 17½ for Casting. The market was all one way until about June 24 when the London market broke over £2 per ton and while some of this decline was made up later the confidence in the market received a bad bump, and further buying was halted for a few days. Later again London declined another 15s. and at the close of the month prices in that market are about £2 10s. below the highest, but compared with the end of May prices are about £1 5s. higher.

Producers, as usual on an advancing market, have been able to give out all sorts of fairy stories about the enormous demand from consumers and some seemed worried to death about being apparently unable to fill the orders that were being forced on them. In their spare moments, if they ever had any, the impression seemed to get around in the trade that the producers actually had to resort to prayers in the different offices for the purpose of stopping what they called a "runaway" market. The producers did really seem so terribly anxious that the price of copper should not go "too high," their agony was pitiful to see. Their prayers were probably answered by the breaks of £2 10s. in London. The funny part of the whole story is that all this talk of a "runaway" market was started by the producers and they have been pegging the market persistently on every advance in London; 5s. up in London meant 5 points here, 10s. 10 points, and so on every time and then when London comes lower these pious producers make no difference in their prices, 17¾ was their price when London was up to £80 and some of them are asking 17¾ today with London £3 lower.

Copper market at present is weak and unsettled—London £8 down from the highest—equal to about 2 cents per pound. Producers are trying to hold the market, but there are no buyers.

There is a big increase in new production that has not yet come on the market and with consumers pretty well covered up to September we should have an easier market. Lake today is quotable at 17½ cents, Electrolytic 17½ and Casting 17¼ cents.

TIN.

The tin market during the month has been exciting and a good deal of "feeling" was generated, the atmosphere at times was well up in the nineties. The whole cause of the disturbance was the docksters strike in London and the tying up of tin that was due here in June. Advantage was taken of the situation and prices were run up from 3 to 4 cents per pound over the actual London cost. Consumers, naturally, bought very sparingly and the squeeze is over, but the strike is still on in London and prices for July may be quite high owing to delayed shipments and a heavier American demand.

Spot tin is quoted at 45¼ cents, July delivery 45¾ cents, August and September around 44 to 44½ cents.

LEAD.

The Trust got busy and put up the price of lead 30 points to 4½ New York basis. About 250 tons of lead changed hands on the afternoon of the day preceding the advance. The market today is steady at 4.50 New York for carload lots shipment from St. Louis. Later—The trust has advanced price ¼ cent per up to 4.75 New York 50-ton lots.

SPELTER.

The spelter market looks strong and spot stocks are well taken care of and the manipulators of the market are able to mark up the spot price to 7 cents at St. Louis and around 7.25 for New York carload lots.

ALUMINUM.

Market rather firmer at 22½ to 23 cents for 98.99 per cent. pure ingots against 22 cents a month ago.

ANTIMONY.

No changes in market; Cookson's held at 8 cents and Hallett's 7¾.

SILVER.

Market has held very steady and prices are shade higher than a month ago. Closing 61¼ New York, 28 3/16d. in London.

QUICKSILVER.

Market dull and easier at $40.50 for wholesale lots with jobbing lots at $41 to $41.50.

SHEET METAL.

Copper wire has been advanced to 18¾ base with sheet copper up to 22 cents base. All brass prices have been advanced accordingly with high sheet brass 18 cents base.

OLD METALS.

The runaway market in copper was the salvation of the scrap metal market and some dealers are reported to have made fortunes. The market today is dull and with shipping more or less tied up abroad the export demand is not so very brisk.—J. J. A.

COPPER PRODUCTION

(Issued by the Copper Producers' Association.)
July 9, 1912.

Stocks of marketable copper of all kinds on hand at all points in the United States, June 1, 1912..		49,615,643
Production of marketable copper in the United States from all domestic and foreign sources during June, 1912.....		122,315,240
		171,930,883
Deliveries:		
For domestic consumption.....	66,146,229	
For export	61,449,650	
		127,595,879
Stocks of marketable copper of all kinds on hand at all points in the United States, June 1, 1912....		44,335,004
Stocks decreased during the month of June.....		5,280,639

JUNE MOVEMENTS IN METALS

COPPER.	Highest.	Lowest.	Average.
Lake	17.75	17.15	17.50
Electrolytic	17.60	17.00	17.30
Casting	17.40	16.75	17.10
TIN	48.90	45.90	47.85
LEAD	4.50	4.20	4.45
SPELTER	7.15	6.95	7.10
ANTIMONY (Hallett's)	7.75	7.75	7.75
SILVER	62.00	60¾	61.31

WATERBURY AVERAGE

The average price of lake copper per pound as determined monthly at Waterbury, Conn.:

1911—Average for year 12¾. 1912—January, 14½; February, 14½; March, 15; April, 16; May, 16⅜; June 17½ cents.

DAILY METAL PRICES

We have made arrangements with the New York Metal Exchange by which we can furnish our readers with the Official Daily Market Report of the Exchange and a year's subscription to THE METAL INDUSTRY for the sum of $10. The price of the Report alone is $10. Sample copies furnished for the asking. We can furnish daily telegraphic reports of metal prices. Address THE METAL INDUSTRY, 99 John street, New York.

INFORMATION BUREAU

Any firm intending to buy metals, machinery or supplies, and desiring the names of the various manufacturers and sellers of these products can obtain the desired information by writing to THE METAL INDUSTRY, 99 John street, New York. Commercial questions are answered by return mail. Our Information Bureau is for the purpose of answering questions of all kinds.

Metal Prices, July 8, 1912

NEW METALS.	Price per lb. Cents.
COPPER—PIG, BAR AND INGOT AND OLD COPPER. Duty Free, Manufactured 2½c. per lbs.	
Lake, carload lots	17.50
Electrolytic, carload lots	17.50
Casting, carload lots	17.25
TIN—Duty Free.	
Straits of Malacca, carload lots	47.00
LEAD—Duty Pige, Bars and Old, 2½c. per lb.; pipe and sheets, 2⅜c. per lb.	
Pig lead, carload lots	4.50
SPELTER—Duty 1⅜c. per lb. Sheets, 1⅝c. per lb.	
Western, carload lots	7.15
ALUMINUM—Duty Crude, 7c. per lb. Plates, sheets, bars and rods, 11c. per lb.	
Small lots	26.00
100 lb. lots	24.00
Ton lots	23.50
ANTIMONY—Duty 1½c. per lb.	
Cookson's cask lots, nominal	8.00
Hallett's cask lots	7.75
Chinese	7.25
Hungarian grade	7.25
NICKEL—Duty Ingot, 6c. per lb. Sheet, strip and wire 35 per cent. ad valorem.	
Shot, Plaquettes, Ingots, Blocks according to quantity	.40 to .50
MANGANESE METAL—Duty 20 per cent	**.90**
MAGNESIUM METAL—Duty 3 cents per pound and 25 per cent. ad valorem (100 lb. lots)	**1.50**
BISMUTH—Duty free	**2.00**
CADMIUM—Duty free	**.90**
CHROMIUM METAL—Duty 25 per cent. ad val	.98
QUICKSILVER—Duty 7c. per lb	.60
	Price per oz.
GOLD—Duty free	$20.67
PLATINUM—Duty free	45.50
SILVER—Duty free	.61¼

Dealers' Buying Prices. Cents. per lb.	OLD METALS.	Dealers' Selling Prices. Cents per lb.
14.75 to 15.00	Heavy Cut Copper	16.00 to 16.25
14.25 to 14.50	Copper Wire	15.75 to 16.00
13.00 to 13.25	Light Copper	14.00 to 14.25
11.75 to 12.00	Heavy Mach. Comp	13.25 to 13.50
9.00 to 9.25	Heavy Brass	10.50 to 10.75
7.25 to 7.50	Light Brass	8.25 to 8.50
9.00 to 9.25	No. 1 Yellow Brass Turnings	10.00 to 10.25
10.50 to 11.00	No. 1 Comp. Turnings	11.50 to 12.00
3.50 to ——	Heavy Lead	—— to 3.75
4.75 to ——	Zinc Scrap	—— to 5.25
6.00 to 6.50	Scrap Aluminum, turnings	7.00 to 9.00
10.00 to 12.00	Scrap Aluminum, cast, alloyed	10.00 to -3.00
14.00 to 15.00	Scrap Aluminum, sheet (new)	16.00 to 17.50
23.00 to 24.00	No. 1 Pewter	25.00 to 26.00
20.00 to 23.00	Old Nickel	23.00 to 26.00

INGOT METALS.	Price per lb. Cents.
Silicon Copper, 10% ..... according to quantity	27 to 32
Silicon Copper, 20% ..... " "	30 to 32
Silicon Copper, 30% guaranteed " "	32 to 34
Phosphor Copper, guaranteed 10% ..... " "	25 to 28
Phosphor Copper, guaranteed 15% ..... " "	27 to 30
Manganese Copper, 25% ..... " "	35 to 40
Phosphor Tin, guaranteed 5% .. " "	58 to 61
Phosphor Tin, no guarantee .... " "	51 to 53
Brass Ingot, Yellow ..... " "	12½ to 12⅞
Brass Ingot, Red ..... " "	13 to 15
Bronze Ingot ..... " "	15 to 15⅜
Manganese Bronze ..... " "	19½ to 21
Phosphor Bronze ..... " "	13 to 16
Casting Aluminum Alloys ..... " "	18¾ to 22¾
PHOSPHORUS—Duty 18c. per lb According to quantity	30 to 35

PRICES OF SHEET COPPER.

BASE PRICE, 21.50 Cents per Lb. Net.

PRICES MENTIONED BELOW ARE FOR QUANTITIES OF 100 LBS. AND OVER.

SIZE OF SHEETS.		64 oz. and over 50 lb. sheet 30 x 60 and heavier.	32 oz. to 64 oz. 25 to 50 lbs. sheet 30 x 60.	24 oz. to 32 oz. 18¾ to 25 lb. sheet 30 x 60.	16 oz. to 24 oz. 12½ to 18¾ lb. sheet 30 x 60.	14 oz. and 15 oz. 11 to 12½ lb. sheet 30 x 60.	12 oz. and 13 oz. 9½ to 11 lb. sheet 30 x 60.	10 oz. and 11 oz. 7¾ to 9½ lb. sheet 30 x 60.	8 oz. and 9 oz. 6¼ to 7¾ lb. sheet 30 x 60.	Lighter than 8 oz.
		Cents Per Pound Over Base Price for Soft Copper								
Not wider than 30 ins.	Not longer than 72 inches.	Base	Base	Base	Base	1	2	3	6	9
	Longer than 72 inches. Not longer than 96 inches.	"	"	"	"	1	3	6	9	
	Longer than 96 inches.	"	"	"	"	2	6			
Wider than 30 ins. but not wider than 36 inches.	Not longer than 72 inches.	"	"	"	"	2	4	7	10	
	Longer than 72 inches. Not longer than 96 inches.	"	"	"	"	2	6	9		
	Longer than 96 inches. Not longer than 120 inches.	"	"	"	1	3				
	Longer than 120 inches.	"	"	1	2					
Wider than 36 ins. but not wider than 48 inches.	Not longer than 72 inches.	"	"	1	2	4	7	10		
	Longer than 72 inches. Not longer than 96 inches.	"	"	1	3	5	8			
	Longer than 96 inches. Not longer than 120 inches.	"	"	2	4	8				
	Longer than 120 inches.	"	1	3	6					
Wider than 48 ins. but not wider than 60 inches.	Not longer than 72 inches.	"	Base	1	3	6	11			
	Longer than 72 inches. Not longer than 96 inches.	"	"	2	4	9				
	Longer than 96 inches. Not longer than 120 inches.	"	1	3	6					
	Longer than 120 inches.	1	2	4	8					
Wider than 60 ins. but not wider than 72 ins.	Not longer than 96 inches.	Base	1	3	8					
	Longer than 96 inches. Not longer than 120 inches.	"	2	5	10					
	Longer than 120 inches.	1	3	8						
Wider than 72 ins. but not wider than 108 ins.	Not longer than 96 inches.	1	3	6						
	Longer than 96 inches. Not longer than 120 inches.	2	4	7						
	Longer than 120 inches.	3	5	9						
Wider than 108 ins.	Not longer than 132 inches.	4	6							
	Longer than 132 inches.	5	8							

The longest dimension in any sheet shall be considered at its length.

CIRCLES, SEGMENTS AND PATTERN SHEETS, advance over prices of Sheet Copper required to cut them from 3 cents per pound.

COLD OR HARD ROLLED COPPER, 14 oz. per square foot, and heavier, add ..... 1 " " "

COLD OR HARD ROLLED COPPER, lighter than 14 oz., per square foot, add ..... 2 " " "

POLISHED COPPER, 20 INCHES WIDE and under, advance over price for Cold Rolled Copper of corresponding dimensions and thickness ..... 1 " " sq. ft.

POLISHED COPPER, WIDER THAN 20 INCHES, advance over price for Cold Rolled Copper of corresponding dimensions and thickness ..... 2 " " " "

COLD ROLLED COPPER, PREPARED SUITABLE FOR POLISHING, same as Polished Copper of corresponding dimensions and thickness.

COLD ROLLED AND ANNEALED COPPER SHEETS OR CIRCLES, same price as Cold or Hard Rolled Copper of corresponding dimensions and thickness.

ROUND COPPER ROD, ⅜ inch diameter or over ..... **Base Price.**
(Rectangular, Square and Irregular Shapes, Copper Rod, Special Prices.)

	Cents per lb.
ZINC—Duty, sheet, 1½c. per lb.	
Carload lots, standard sizes and gauges, at mill	8.75 less 8%
Casks, jobbers' prices	9¼
Open casks, jobbers' prices	9¾

Metal Prices, July 8, 1912

PRICES ON BRASS MATERIAL—MILL SHIPMENTS.
In effect July 1, 1912, and until further notice.

To customers who buy over 5,000 lbs. per year.

	Net base per lb. High Brass.	Low Brass.	Bronze.
Sheet	$0.16¾	$0.18⅝	$0.20½
Wire	.16½	.18⅝	.20½
Rod	.16½	.19⅝	.21½
Brazed tubing	.21⅝	—	.25¼
Open seam tubing	.20¼	—	.23¼
Angles and channels, plain	.20⅝	—	.23¾

50% discount from all extras as shown in American Brass Manufacturers' Price List No. 8.

NET EXTRAS FOR QUALITY.

Sheet—Extra spring drawing and spinning brass	½c.	per lb.	net	advance
" —Best spring, drawing and spinning brass	1½c.	"	"	"
Wire —Extra spring and brazing wire	½c.	"	"	"
" —Best spring and brazing wire	1c.	"	"	"

To customers who buy 5,000 lbs. or less per year.

	Net base per lb. High Brass.	Low Brass.	Bronze.
Sheet	$0.18	$0.19⅞	$0.21⅜
Wire	.17⅝	.19⅞	.21⅜
Rod	.17⅝	.20⅝	.22⅜
Brazed tubing	.22⅝	—	.26½
Open seam tubing	.21¼	—	.24½
Angles and channels, plain	.21⅞	—	.25

5% discount from all extras as shown in American Brass Manufacturers' Price List No. 8.

NET EXTRAS FOR QUALITY.

Sheet—Extra spring drawing and spinning brass	½c.	per lb.	net	advance
" —Best spring, drawing and spinning brass	1½c.	"	"	"
Wire —Extra spring and brazing wire	½c.	"	"	"
" —Best spring and brazing wire	1c.	"	"	"

BARE COPPER WIRE—CARLOAD LOTS.

19 per lb. base.

SOLDERING COPPERS.

300 lbs. and over in one order	23c.	per lb. base
100 lbs. to 300 lbs. in one order	23½c.	" " "
Less than 100 lbs. in one order	25c.	" " "

PRICES FOR SEAMLESS BRASS TUBING.

From 1¼ to 3½ O. D. Nos. 4 to 13 Stubs' Gauge, 21c. per lb.
Seamless Copper Tubing, 25c. per lb.

For other sizes see Manufacturers' List.

PRICES FOR SEAMLESS BRASS TUBING Iron Pipe Sizes.

Iron pipe Size	⅛	¼	⅜	½	¾	1	1¼	1½	2	2½	3	3½	4	4½	5	6
Price per lb.	29	28	23	22	21	21	21	21	21	21	21	22	23	25	27	28

PRICE LIST OF IRON LINED TUBING—NOT POLISHED.

	Per 100 feet— Brass.	Bronze.
Sheet	$0.19½	$0.21
Wire	.19¼	.21
Rod	.20	.22
Brazed tubing	—	.25⅝
Open seam tubing	—	.24⅜
Angles and channels, plain	—	.24¼
1⅛ inch	.22	.24
1¼ inch	.25	.27
1½ inch	.32	.35
1⅝ inch	.45	.48
2 inch	.56	.60

Discount 50%.

PRICE FOR TOBIN BRONZE AND MUNTZ METAL.

Tobin Bronze Rod	18½c.	net base
Munts or Yellow Metal Sheathing (14" x 48")	17½c.	" "
" " " Rectangular sheets other than Sheathing	20c.	" "
" " " Rod	18c.	" "

Above are for 100 lbs. or more in one order.

PLATERS' METALS.

Platers' bar in the rough, 27c. net.

German silver platers' bars dependent on the percentage of nickel, quantity and general character of the order.

Platers' metal, so called, is very thin metal not made by the larger mills and for which prices are quoted on application to the manufacturers.

PRICES FOR SHEET BLOCK TIN AND BRITANNIA METAL.

Not over 18 in. in width, not thinner than 28 B. S. Gauge, 2c. above price of pig tin in same quantity.

Not over 35 in. in width, not thinner than 22 B. S. Gauge, 3c. above price of pig tin.

PRICE SHEET FOR SHEET ALUMINUM—B. & S. Gauge.

	Wider than..... 3in.	6in.	14in.	16in.	18in.	20in.	24in.	30in.	36in.
	and including..... 12in.	14in.	16in.	18in.	20in.	24in.	30in.	36in.	40in.
	in coils.								
No. 13 and heavier	34	34	36	36	36	36	39	39	39
" 14	34	34	36	36	36	36	39	39	39
" 15	34	34	36	36	36	36	39	39	39
" 16	34	34	36	36	36	36	39	39	39
" 17	34	34	36	36	36	36	39	39	39
" 18	34	34	36	36	36	36	39	39	42
" 19	34	34	36	36	36	36	39	40	43
" 20	34	36	36	36	36	38	41	42	44
" 21	34	38	38	38	38	40	43	44	50
" 22	34	38	38	38	40	40	43	47	51
" 23	34	38	38	38	40	40	43	49	52
" 24	34	38	40	42	42	42	45	51	54
" 25	36	39	41	43	43	43	46	53	57
" 26	36	39	42	46	46	46	51	55	61
" 27	36	40	44	48	48	49	54	58	64
" 28	36	40	46	48	49	49	56	62	67
" 29	38	41	48	50	52	52	61	67	72
" 30	38	42	50	52	56	62	69	72	77
" 31	43	47	55	58	63	71	74	77	83
" 32	45	49	57	61	69	77	91	90	95
" 33	47	51	60	65	73	84	91	100	110
" 34	50	55	62	70	78	91	103	110	120
" 35	..	65	70	80	90	100	115	125	..
" 36	..	80	90	100	115	120	135	..	..
" 37	..	104	114	129	144	159	174	..	..
" 38	..	124	139	154	169	184	204	..	..
" 39	..	144	164	184	204	224	..	..	..
" 40	..	174	204	224	244	..	..	..	..

In flat rolled sheets the above prices refer to lengths between 2 and 3 feet. Prices furnished by the manufacturers for wider and narrower sheet. All columns except the first refer to flat rolled sheet. Prices are 100 lbs. or more at one time. Less quantities 5c. lb. extra. Charges made for boxing.

PRICE LIST SEAMLESS ALUMINUM TUBING.

STUBS' GAUGE THE STANDARD. SIZES CARRIED IN STOCK.
Outside Diameters. BASE PRICE, 25 Cents per Pound.

Stubs' Gauge.	Inches.	¼ in.	5-16 in.	⅜ in.	½ in.	⅝ in.	¾ in.	⅞ in.	1 in.	1¼ in.	1½ in.	1¾ in.	2 ins.	2½ ins.	3 ins.	3½ ins.	4 ins.	4½ ins.
11.	.120.	..	..	..	..	..	..	..	27	24	..	..	14	20	10	9	16	23
12.	.109.	..	..	..	..	..	..	..	26	..	..	..	15	..	..	..	..	..
14.	.083.	..	..	..	..	..	..	..	..	..	..	..	17	..	..	..	..	..
16.	.065.	..	..	..	..	..	28	27	27	24	23	21	21	21	21	27	31	37
18.	.049.	..	..	..	..	23	30	29	28	25	26	26	26	..	..	..	..	..
20.	.035.	117	..	46	39	34	33	32	30	29	30	30	30	31	38	49	58	81
21.	.032.	..	..	..	40	..	..	..	..	..	..	..	..	..	..	..	..	..
22.	.028.	138	98	48	42	38	37	35	34	..	..	45	..	..	..	..	..	..
24.	.022.	188	133	108	88	79	73	62	60	66	..	..	..	..	..	..	..	..

Prices are for ten or more pounds at one time. For prices on sizes not carried in stock send for Manufacturers' List.

PRICE LIST FOR ALUMINUM ROD AND WIRE.

Diameter. B. & S. G'ge	000 to No. 10.	No. 11.	No. 12.	No. 13.	No. 14.	No. 15.	No. 16.	No. 17.	No. 18.	No. 19.	No. 20.	No. 21.	No. 22.
Price, per lb.	32	32½	32½	33	33½	34	34½	35	36	37	38	43	46

PRICE LIST FOR GERMAN SILVER IN SHEETS AND ROLLS.

Per cent.	Price per lb.	Per cent.	Price per lb.
12	$0.52	16	$0.58
13	.53	17	.59
14	.54	18	.60
15	.55		

These prices are for sheets and rolls over 2 inches in width, to and including 8 inches in width and to No. 20, inclusive. American or Brown & Sharpe's Gauge. Prices are for 100 lbs. or more of one size and gauge in one order. Discount 50%.

GERMAN SILVER TUBING.

4	per cent.	to No. 19, B. & S. Gauge, inclusive			$0.60
6	"	" 19, " " "			.70
9	"	" 19, " " "			.85
12	"	" 19, " " "			1.00
15	"	" 19, " " "			1.15
16	"	" 19, " " "			1.20
18	"	" 19, " " "			1.30

German Silver Tubing thinner than No. 19 B. & S. Gauge add same advances as for Brazed Brass Tube.

For cutting to special lengths add same advances as for Brazed Brass Tube. Discount 40%.

PRICES OF SHEET SILVER.

Rolled sterling silver .925 fine is sold according to gauge quantity and market conditions. No fixed quotations can be given, as prices range from 2c. below to 6c. above the price of bullion.

Rolled silver anodes .999 fine are quoted at 2c. to 3½c. above the price of bullion.